96TH CONGRESS : : : : 1ST SESSION

JANUARY 15, 1979–JANUARY 3, 1980

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96th Congress, 1st Session - - - - - - - - - - - - House Document No. 96–126

CAZENOVIA CREEK WATERSHED
NEW YORK

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

TRANSMITTING

A CORPS OF ENGINEERS REPORT ON THE CAZENOVIA CREEK WATERSHED, NEW YORK, IN PARTIAL RESPONSE TO TWO RESOLUTIONS OF THE HOUSE COMMITTEE ON PUBLIC WORKS ADOPTED JUNE 13, 1956, AND JUNE 14, 1972, AND TO A RESOLUTION OF THE SENATE COMMITTEE ON PUBLIC WORKS ADOPTED JULY 10, 1961

MAY 16, 1979.—Referred to the Committee on Public Works and Transportation and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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LETTER OF TRANSMITTAL

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

MAY 1 1979

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

I am transmitting herewith a favorable report dated 8 September 1977, from the Chief of Engineers, Department of the Army, on Cazenovia Creek Watershed, New York, together with other pertinent reports. The report has been prepared in partial response to two resolutions by the Committee on Public Works, House of Representatives, adopted 13 June 1956 and, 14 June 1972, and to a resolution by the Committee on Public Works, United States Senate, adopted 10 July 1961.

The views of the State of New York; the Departments of the Interior; Agriculture; Transportation; Health, Education, and Welfare; Housing and Urban Development and the Environmental Protection Agency, are set forth in the inclosed communications. The environmental statement required by the National Environmental Policy Act of 1969 has been submitted to the Environmental Protection Agency.

The President, in his June 6, 1978 water policy message to Congress, proposed several changes in cost sharing for water resources projects to allow states to participate more actively in project implementation decisions and to equalize cost sharing between structural and non-structural flood control projects. The changes include a cash contribution from benefiting states of 5% of construction (first) costs associated with nonvendible outputs and 10% of costs associated with vendible outputs. Application of this policy to the Cazenovia Creek Watershed project would require the State of New York to contribute an estimated $87,500 in cash (5% of $1,750,000 total estimated project first cost based on January 1977 price levels).

The President also proposed that the present cost-sharing requirements for flood control projects be modified to require a cash or in-kind contribution equal to 20% of the project first costs associated with flood control benefits. Application of this policy to the Cazenovia Creek Watershed project would require that non-Federal interests make, in addition to the state contribution, a cash or in-kind contribution of an estimated $350,000 (20% of $1,750,000). The combined non-Federal share would be 25% of project first costs and non-Federal costs shown in the report of the Chief of Engineers would change from $300,000 to $437,500.

I recommend construction authorization for the Cazenovia Creek Watershed project in accordance with the President's proposed cost sharing policies.

The Office of Management and Budget advises that there is no objection to the submission of the Chief of Engineers report to the Congress or to authorization of the proposed project as amended to conform with the President's water policy. However, it states that no commitment can be made at this time as to when appropriations would be requested for the project, if authorized by the Congress, since this would be subject to review in the President's annual budget process. A copy of the letter from the Office of Management and Budget is inclosed as part of the report.

Sincerely,

Michael Blumenfeld
Assistant Secretary of the Army
(Civil Works)

1 Incl
As stated

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

23 March 1979

Honorable Clifford Alexander
Secretary of the Army
Washington, D.C. 20310

Dear Mr. Secretary:

Deputy Under Secretary Michael Blumenfeld's letter of December 11, 1978, submitted a report of the Chief of Engineers on Cazenovia Creek Watershed, New York, in accordance with Section 4 of Executive Order No. 9384, and requested information as to the relationship of the report to the program of the President.

We have reviewed the report of the Chief of Engineers in light of the President's Water Policy Message to the Congress of June 6, 1978. We conclude that Cazenovia Creek, if modified, meets the project selection criteria specified by the President.

We also note that your proposed letters to the Speaker of the House of Representatives and to the Chairman, Committee on Environment and Public Works of the Senate recommend the necessary modifications to the project to conform it to the cost-sharing policies adopted by the President.

There is no objection to the transmission of the report to the Congress or to the authorization of the project, if modified as you have proposed, from the standpoint of the President's water policy. No commitment, however, can be made at this time as to when appropriations would be requested for the project, if authorized by the Congress, since this would be subject to review in the President's annual budget process.

Sincerely,

Eliot R. Cutler
Associate Director for
Natural Resources,
Energy and Science

COMMENTS OF THE STATE OF NEW YORK

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

PETER A. A. BERLE
COMMISSIONER

January 13, 1977

Dear Colonel Creel:

This is in reply to your letter of December 16, 1976, and the earlier letter of August 9, 1976, from General Morris regarding the proposed report of the Chief of Engineers on Cazenovia Creek Watershed, New York. Department staff have worked closely with Buffalo District during development of the feasibility report and EIS and have provided detailed comments upon the draft reports.

The proposed final report reflects the comments provided to the District and this Department has no further comments to offer on behalf of New York State. The State strongly supports the authorization by Congress of the plan proposed by the Chief of Engineers.

Sincerely,

Peter A. A. Berle

Colonel Tilford C. Creel
Assistant Director of Civil Works,
Upper Mississippi Basin and Great Lakes
Department of the Army
Office of the Chief of Engineers
Washington, DC 20314

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-76/784 November 5, 1976

Dear General Morris:

Thank you for the letter of August 11, 1976, requesting our views and comments on the draft environmental statement and interim report for Flood Management in Cazenovia Creek Watershed, Erie County, New York. We have reviewed the documents and conclude that they adequately considered those areas within our jurisdiction and expertise. We are especially pleased with the consideration the Corps of Engineers has given to most of our previous comments. However, we wish to reiterate the concern expressed in our letter of January 9, 1975, that "The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of that statement."

We do not believe the response to this comment, which is included in the subject document, fully addresses our concern. The final statement should include copies of relevant communications with the Erie-Niagara Counties Regional Planning Board attesting to the compatibility of the project with their Regional Recreation Plan. In the event that post-authorization studies indicate that the project site would serve as an important link in a streamside trail system, the project should be designed to incorporate suitable rights-of-way, gradients and such other allowances as are necessary for trail construction. In this way, the project will not merely be compatible with existing recreation plans, but will provide an existing base for the implementation of these plans.

Sincerely yours,

Stanley D. Doremus
Deputy Assistant Secretary of the Interior

Lt. General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

COMMENTS OF THE DEPARTMENT OF AGRICULTURE

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

29 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Office of the Chief of Engineers
Army Corps of Engineers
U.S. Department of the Army
Washington, D.C.

Dear General Morris:

In accordance with your letter of August 9, 1976, we have reviewed the report and the revised draft environmental impact statement on Cazenovia Creek Watershed, New York.

The proposed works involve the ponding of floodwaters to reduce the incidence of ice jamming. However, the area affected by ponding floodwaters is not discussed with the precision that characterizes much of the report. On page 72 (Main Report) we note reference to impacts on "approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland." Presumably, some current farm uses of land will be displaced by the project. A further description of the farmland, the intensity of its use, identification of prime farmland soils, and impacts on these by the project would be appropriate and should also be included in the environmental impact statement.

We appreciate the opportunity to review and comment on these reports.

Sincerely,

Paul A. Vander Myde

COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U.S. COAST GUARD (G-WS/73)
WASHINGTON, D.C. 20590
PHONE (202) 426-2262

11 November 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Dear General Morris:

This is in response to your letter of 9 August 1976 addressed to Secretary Coleman concerning a revised draft environmental impact statement on Cazenovia Creek and Cayuga Creek Watershed, Buffalo, Erie County, New York.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

D J Riley

D. J. RILEY
Captain, U. S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

COMMENTS OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

6 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Morris:

The Department's New York Regional Office has reviewed the draft environmental impact statement concerning the Cazenovia Creek Watershed, New York. On the basis of this review, we feel that impacts in those areas of concern to this Department have been adequately addressed.

Thank you for the opportunity to review the document.

Sincerely,

Charles Custard
Director
Office of Environmental Affairs

COMMENTS OF THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BUFFALO AREA OFFICE
GRANT BUILDING, 560 MAIN STREET, BUFFALO, NEW YORK 14202

September 14, 1976

IN REPLY REFER
2.2CS/WS

Mr. Marvin W. Rees
Executive Director of Civil Works
DAEN-CWP-A
Department of Army
Office of the Chief of Engineers
Washington, D.C. 20314

Dear Mr. Rees:

Subject: Draft Environmental Impact Statement, Buffalo district, Corps of Engineers Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed

A review of the Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed indicates; that this project is consistent with HUD objectives and should make residential development more attractive in the Cazenovia Creek Watershed Area.

Sincerely,

Frank D. Cerabone
Area Director

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

Class. LO-1

1 October 1976

Colonel Bernard C. Hughes
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have reviewed the Addendum to the Cazenovia Creek Revised Draft Environmental Impact Statement (EIS) concerning archaeological resources and are somewhat confused as to how an addendum to a revised draft EIS can be issued before the revised draft EIS.

Nevertheless, our review of the addendum and an unofficial copy of the revised draft EIS obtained from the Buffalo District Office, indicates that the proposed project should not produce significant adverse environmental impacts.

In accordance with EPA procedures, we have rated the revised draft EIS and the addendum as LO-1, indicating that we lack objection to the project as proposed (LO) and that the environmental impacts of the project are adequately set forth in the documents (1).

If you have any questions concerning this letter, please feel free to contact our office at 8-264-8556. A copy of the final EIS is requested for subsequent review.

Sincerely yours,

Barbara M. Metzger
Chief
Environmental Impacts Branch

CAZENOVIA CREEK WATERSHED, NEW YORK

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314

REPLY TO
ATTENTION OF:

DAEN-CWP-A

8 September 1977

SUBJECT: Cazenovia Creek Watershed, New York

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers, on Cazenovia Creek Watershed. These reports are in partial response to two resolutions by the Committee on Public Works of the United States House of Representatives, adopted 13 June 1956 and 14 June 1972, and to a resolution by the Committee of Public Works of the United States Senate adopted 10 July 1961. These resolutions requested a review of the report on Cazenovia and Cayuga Creeks published in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determining what improvements for flood control and allied purposes are advisable at this time.

2. The District and Division Engineers recommend authorization of an ice retention structure on Cazenovia Creek in the town of West Seneca, New York, to provide flood protection. The estimated first cost is $1,137,000, of which $897,000 would be Federal and $240,000 would be non-Federal. Based on an interest rate of 5-7/8 percent and a 100-year period for economic analysis, annual charges are estimated at $78,400, including $10,500 for non-Federal operation and maintenance. Average annual benefits are estimated at $204,300, and the benefit-cost ratio is 2.6.

3. The estimated January 1977 first cost of the project is $1,750,000, of which $1,450,000 would be Federal and $300,000 would be non-Federal. Based on an interest rate of 6-3/8 percent and a 100-year period for economic analysis, annual charges are estimated at $125,600, annual benefits are $242,700, and the benefit-cost ratio is 1.9.

4. The Board of Engineers for Rivers and Harbors concurs generally in the findings of the reporting officers and recommends that the proposed flood control improvements be authorized for construction subject to certain items of local cooperation. Included is a requirement that non-Federal interests agree to adopt a program of flood plain

information and regulation to insure compatibility between future development and protection levels provided by the project. The Board further finds that there is a potential for recreational development at this project which should be evaluated during post authorization studies.

5. I concur in the views and recommendations of the Board.

Ernest Graves
ERNEST GRAVES
Major General, USA
Acting Chief of Engineers

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060

REPLY TO
ATTENTION OF:

DAEN-BR 11 March 1976

SUBJECT: Buffalo Metropolitan Area, Cazenovia Creek Watershed, New York

Chief of Engineers
Department of the Army
Washington, D.C.

1. Authority.--This interim report is in partial response to the following resolutions adopted 13 June 1956, 10 July 1961, and 14 June 1972, respectively:

> Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on Cazenovia Creek and Cayuga Creek, New York, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determining what improvements for flood control are advisable at this time.

> Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report of the Chief of Engineers on Cayuga, Buffalo and Cazenovia Creeks, New York, submitted to Congress on November 7, 1949, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein is advisable at this time, with particular reference to Buffalo Creek, New York, in the interest of flood control and allied purposes, including water supply.

> Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Cazenovia Creek, and Cayuga Creek, New York, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to

> determine whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to providing improvements in the interest of flood control, wastewater management, water supply, water quality, environmental quality, recreation and fish and wildlife for the Buffalo River Basin, New York.

Other reports in final response to these resolutions will be submitted later. Interim reports on Cayuga and Tonawanda Creeks are currently being prepared. A comprehensive report, the Buffalo Metropolitan Area Study, is also underway and will address the remaining water and related needs of the basin.

2. Description. --Cazenovia Creek, the largest tributary of the Buffalo River, is about 39 miles in length and drains 138 square miles of central Erie County, New York. From its source in the Allegheny Plateau, Cazenovia Creek flows generally north in two branches which join together in the region of East Aurora. The mainstem continues in a northwesterly direction until it joins the Buffalo River, about 6 miles from Lake Erie. The upper basin has steep-sloping streams in eroded valleys, while streams in the lower basin flow through the flatlands of the Erie Plain.

3. Economic development. --Land uses in the Cazenovia Creek basin follow a typical pattern of changes. Agricultural land uses are being supplanted by residential, commercial, and industrial development which are expanding outward from the central hub of activity in the city of Buffalo. While upper basin communities are still agriculturally oriented, central and lower basin communities are now undergoing the process of urbanization, as farmlands are being subdivided for residential uses. Urbanization and the decline of agriculture are expected to continue. The most concentrated residential, commercial, and industrial developments are in the lower basin. The lower basin includes the major population centers of West Seneca and South Buffalo. West Seneca is one of the fastest growing communities, in terms of population, in western New York. The population of the basin is approximately 164,000, and is projected to increase to 252,000 by the year 2000.

4. Existing or authorized improvements. --Improvements to provide flood protection at various locations along Cazenovia Creek and Tannery Brook have been made by Federal and non-Federal interests. The Corps of Engineers completed two small snagging and clearing projects on Cazenovia Creek in the town of West Seneca in 1949 and 1971. Sections of the creek banks have been protected by riprap placed

by the Soil Conservation Service (SCS). The county Soil and Water Conservation Districts, with SCS assistance, are conducting vegetation planting programs for bank stabilization purposes. Improvements to Cazenovia Creek and Tannery Brook by local interests include vertical retaining walls, levees, enlarged culverts, removal of gravel bars, and clearing and snagging.

5. Problems and needs. --Flooding is the paramount water-related problem in the Cazenovia Creek basin. Damaging floods along the creek generally occur during late winter and early spring when major runoff events from snowmelt and rainfall on frozen ground frequently combine with ice-jam conditions. Runoff which would not be damaging under ice-free conditions has resulted in severe damage when ice jams temporarily dam the channel and cause higher than normal stages. Flood records indicate that the maximum discharges occurred during the floods of 1955, 1956, and 1959. A damage survey for the January 1959 flood, the maximum stage of record, indicated damages to be about $450,000 based on development of 1960 and 1966 price levels. Most of these damages occurred to urban development.

6. Improvements desired. --During initial public meetings, local interests requested that expeditious action be taken to alleviate the flooding problem. Several solutions, including snagging and clearing, levees, channelization, small reservoirs, and floodproofing, were considered during earlier studies, with the levee alternative considered to be the best overall plan. During final studies, an ice retention structure was found to be the best solution to the flood problem, and this plan is desired by local interests.

7. Plan of improvement. --The District Engineer finds that the most practical plan for flood protection would consist primarily of an ice retention structure to be located on Cazenovia Creek, about 1 mile upstream of Union Road in the town of West Seneca. He also finds that flood plain management and flood insurance are advisable. The proposed project will reduce the flooding conditions along Cazenovia Creek in the town of West Seneca and that area in the city of Buffalo which is located above the backwater effects of the Buffalo River. The main features of the recommended plan include a low reinforced concrete gravity dam, a stilling pool, and a floating log boom. The purpose of the plan is to protect against increased stages resulting from ice jams. Protection during periods of excessive runoff is not provided. Therefore, the protection afforded by the proposed improvements would be essentially the same as would exist under normal ice-free conditions, and would be determined by the capacity of the existing channel. Although most of the downstream reaches would have a

relatively low degree of protection because of limited channel capacity, the major damage area located in the town of West Seneca would be protected from the 125-year flood.

8. Economic evaluation. --The District Engineer estimates the total first cost of the proposed improvement, based on October 1974 price levels, to be $1,137,000, of which $897,000 would be Federal and $240,000 would be non-Federal. The annual charges, based on a 100-year period for economic analysis and an interest rate of 5-7/8 percent, are estimated at $78,400. Of this amount, $53,800 would be Federal and $24,600, including $10,500 for maintenance and operation, would be non-Federal. The average annual benefits are estimated at $204,300, and the benefit-cost ratio is 2.6.

9. Recommendations of the reporting officers. --The District Engineer recommends authorization of improvements for flood control on Cazenovia Creek, New York, generally in accordance with plans described in his report and subject to certain items of local cooperation. The Division Engineer concurs.

10. Public notice. --The Division Engineer issued a public notice stating the recommendations of the reporting officers and affording interested parties an opportunity to present additional information to the Board. Careful consideration has been given to the communications received.

Views and Recommendations of the Board of Engineers for Rivers and Harbors.

11. Views. --The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers. The recommended improvements are economically justified and the requirements of local cooperation are generally appropriate. Non-Federal costs associated with these local requirements are presently estimated at $240,000 for lands, easements, and rights-of-way, and $10,500 annually for operation and maintenance of the project works. The Board notes that use of the currently prescribed interest rate of 6-1/8 percent would not significantly affect the economic justification of the recommended project.

12. The Board believes that sufficient data are available to demonstrate that the use of an ice retention structure for the purpose of alleviating flooding caused by ice jams is feasible, but notes that certain design details of the proposed structure may warrant further consideration. In order to establish final design of the ice retention structure and to verify its structural and functional adequacy, the Board believes that model testing during postauthorization studies is desirable. It is estimated that the cost of a model test would be approximately $70,000.

13. The Board notes that the Erie and Niagara Counties Regional Planning Board has a regional recreation plan which includes trailways along both sides of Cazenovia Creek in the vicinity of the project area. It understands that the recreation plan being considered in the comprehensive study now underway for the Buffalo metropolitan area includes bike and nature trails along Cazenovia Creek in the project vicinity. The Board therefore believes that some recreational potential may be afforded by the proposed project. This potential may include the operation of a permanent pool and development of a small day-use recreation area and trails which could serve as an important link between existing and proposed recreation facilities located downstream and upstream. Accordingly, the Board believes that the potential recreational development of this project should be evaluated during the postauthorization studies.

14. The Board has carefully considered the report as to its compliance with the requirements of the Principles and Standards for Planning Water and Related Land Resources established by the Water Resources Council. It believes that the report conforms to the intent of the Principles and Standards, and that the recommendations of the reporting officers have been developed through the application of prescribed planning procedures contained therein to meet the objectives of national economic development and environmental quality. The effects on regional development and social well-being were evaluated, and the Board believes that the proposed improvements would provide a significant contribution to the regional economy and improvement of social well-being. The Board has also carefully considered the environmental effects, including those discussed in the Revised Draft Environmental Impact Statement dated March 1975, and notes that the proposed improvements are expected to have little adverse environmental effect.

15. Recommendations.--Accordingly, the Board recommends that improvements for flood control be authorized for construction on Cazenovia Creek in the town of West Seneca, New York, generally in accordance with the plan of the District Engineer, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable. The first cost to the United States for these improvements is presently estimated at $967,000 for construction, including $70,000 for a model test. These recommendations are made with the provision that, prior to the commencement of construction, non-Federal interests will agree to:

a. Provide without cost to the United States all lands, easements, and rights-of-way, including suitable borrow areas and excavated material disposal areas as determined by the Chief of Engineers, necessary for the construction of the project;

b. Accomplish without cost to the United States all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by the construction;

c. Hold and save the United States free from damages due to the construction works, not including damages due to the fault or negligence of the United States or its contractors;

d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army;

e. At least annually inform affected interests regarding the limitations of the protection afforded by the project;

f. Prescribe and enforce regulations to prevent obstruction or encroachment on the ice retention structure's flood pool and downstream channels which would reduce their flood control function or hinder maintenance and operation; and

g. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the project.

FOR THE BOARD:

J. W. MORRIS
Major General, USA
Chairman

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

This study identified the best plan for flood management in the Cazenovia Creek basin. Many areas along the creek are subject to frequent flooding. Major economic losses occurred during the flood of January 1959 and most recently in March 1972. Also, inherent social problems and direct threats to the health and safety of area residents occur during flood periods. Although some flood management improvements have been made, the magnitude of remaining flood damages and related social and health problems indicate a pressing need for a comprehensive flood damage reduction plan for the Cazenovia Creek basin.

This study, based upon sound engineering, economic, and environmental considerations, disclosed that the most practical plan of improvement would combine both nonstructural and structural measures. Nonstructural measures considered in this plan are the initiation of a program of floodplain management in all towns and villages throughout the basin and participation in the National Flood Insurance Program by basin communities. The structural feature of the recommended plan would be an ice retention structure located approximately one mile upstream of the Union Road Bridge in West Seneca.

The estimated total first cost of the proposed improvements for the Cazenovia Creek basin, exclusive of pre-authorization study costs, is $1,137,000. The total annual cost, including operation and maintenance, is $78,400. The average annual benefits from this plan without affluence benefits would total $153,400, resulting in a benefit/cost ratio for the plan of 1.96. The average annual benefits from this plan with affluence benefits would total $204,300, resulting in a benefit/cost ratio for the plan of 2.61.

It is therefore recommended that the proposed plan for flood management in the Cazenovia Creek basin be adopted.

BUFFALO METROPOLITAN AREA, NEW YORK

WATER RESOURCES MANAGEMENT
INTERIM REPORT ON
FEASIBILITY OF FLOOD MANAGEMENT IN
CAZENOVIA CREEK WATERSHED

THE STUDY AND REPORT

PURPOSE AND AUTHORITY

The purpose of this study was to identify and offer solutions to water and related land resource problems in the Cazenovia Creek basin, with particular attention focused on flood problems. The ultimate goal was to develop, on the basis of engineering, economic, environmental, and social considerations, a plan to reduce flood damages and alleviate other identifiable water and related land resource problems and needs.

This study was conducted and report submitted in partial compliance with a resolution by the Committee on Public Works of the House of Representatives, adopted 13 June 1956, authorizing a survey on Cayuga and Cazenovia Creeks. The resolution reads as follows:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF RESPRESENTATIVES, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on Cazenovia Creek and Cayuga Creek, New York, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determining what improvements for flood control are advisable at this time."

Authority for a survey on Buffalo Creek and its major tributaries was contained in a resolution by the Committee on Public Works of the United States Senate, adopted 10 July 1961. The resolution reads as follows:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report of the Chief of Engineers on Cayuga, Buffalo, and Cazenovia Creeks, New York, submitted to Congress on November 7,1949 and other pertinent reports, with a view to determining whether any modifications

> of the recommendations contained therein is advisable at this time, with particular reference to Buffalo Creek, New York, in the interest of flood control and allied purposes, including water supply."

Preparation of a combined report, in response to the two resolutions, was approved by Office, Chief of Engineers (OCE) on 14 December 1961.

The report authorized for Cayuga, Buffalo, and Cazenovia Creeks, New York, by these earlier resolutions has been combined with an overall Basin Study Report for the entire Buffalo Creek watershed, authorized by a resolution of the House Committee on Public Works adopted on 14 June 1972. This resolution provides for expansion of the study to consider not only flood management and allied purposes, including water supply, but also other water-related problems and needs. The resolution reads as follows:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Cazenovia Creek, and Cayuga Creek, New York, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to providing improvements in the interest of flood control, wastewater management, water supply, water quality, environmental quality, recreation, and fish and wildlife for the Buffalo River Basin, New York."

OCE approved preparation of an interim study report on Cazenovia Creek on 8 May 1972. This interim study was to consider an early action plan for flood management and allied purposes and was not to consider other water-related problems and needs. A subsequent comprehensive study, part of the Buffalo Metropolitan Area Study, will address other water-related problems and needs, including water quality, environmental quality recreation, and fish and wildlife management. The Erie and Niagara Counties Regional Planning Board is conducting a regional wastewater management study, which will encompass all of Niagara and Erie Counties and portions of Wyoming, and Cattaraugus Counties containing the watersheds of streams within the Buffalo Urban Area (SMSA).

SCOPE OF THE STUDY

This study assessed the problems associated with flooding in the Cazenovia Creek watershed, Erie County, New York, including economic losses and social impacts. Alternative structural and nonstructural means of alleviating these problems were considered. A comprehensive flood management plan for the basin, consisting of the most practical and acceptable combination of flood management measures, was developed by making comparative evaluations of alternative measures on the basis of relative beneficial and adverse economic, social, and environmental impacts.

STUDY COORDINATION

During the study, coordination was maintained with various Federal, State, and local agencies and governmental entities, including the U.S. Department of Housing and Urban Development (H.U.D.), the National Park Service, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the U.S. Soil Conservation Service, the Erie and Niagara Counties Regional Planning Board, the Erie-Niagara Basin Regional Water Resources Planning Board, the State Bureau of Fisheries, Erie County, the City of Buffalo, the Town of West Seneca, the Village of East Aurora, the Town of Elma, and the Town of Aurora.

Inputs to the study from the general public were obtained through public meetings and numerous discussions with individuals and organizations in the area. Formal public meetings were held on 11 December 1973, 21 June 1974, and 26 November 1974. Meetings with individuals and local interest groups were held on 22 August, 28 August, and 13 September 1973, and 8 March 1974. A workshop was held on 7 December 1973.

THE REPORT

This report consists of a main report, a technical appendix, and an environmental impact statement. The demography and physical character of the basin as well as the basin's water and related land resource problems and needs are discussed in all three documents. The main report presents in a general and nontechnical manner the rationale and plan selection process used during the investigation of alternative means of solving these problems and needs, particularly the flooding problems. The selected plan is discussed, including the environmental, social, and economic impacts of the plan and the apportionment of costs and division of project responsibilities between the Federal Government and non-Federal interests.

Both the main report and technical appendix follow the same general outline. However, the latter document is intended for the technical reviewer and therefore provides additional and more detailed information. Background material on the resources and economy of the study area is covered more thoroughly. More significantly, the technical appendix discusses in greater detail the plan selection and formulation process and the engineering designs and environmental, social, and economic impacts of the selected plan.

The environmental impact statement is an independent document stressing the existing environmental setting, both natural and human, and the impacts, both favorable and unfavorable, that are likely with the recommended plan of improvement.

PRIOR STUDIES AND REPORTS

This section presents a brief summary of prior studies and reports by various Federal, State, and local agencies, concerning the Cazenovia Creek basin. These earlier investigations discuss many water and related land resource problems and needs, and identify possible solutions to alleviate the problems and meet the needs.

A survey report on Cayuga, Buffalo, and Cazenovia Creeks, submitted to Congress 23 July 1941 and subsequently published in House Document No. 326, 77th Congress, First Session, found flood protection works for Cazenovia Creek to be economically unjustifiable.

House Document No. 574, 78th Congress, Second Session, 5 May 1944, contained a survey report on the Cazenovia Creek watershed prepared by the United States Department of Agriculture, Soil Conservation Service. The report presented the feasibility of various programs for soil erosion prevention for flood management and streambank protection. The report recommended a program of land treatment and streambank protection which has since been implemented by the Erie and Wyoming Counties Soil and Water Conservation District, in cooperation with the S.C.S. Continuation and/or acceleration of such programs will serve to lessen erosion of soil from uplands of Cazenovia Creek watershed and thereby preserve and/or enhance their values, improve the water qualities of streams draining them, and lessen sedimentation in the channels of these streams.

A Corps of Engineers survey report submitted to Congress on 7 November 1949 indicated that neither flood management improvements along the lower reaches of Cayuga, Buffalo, and Cazenovia Creeks nor upstream multi-purpose reservoirs for flood control and water supply were economically feasible.

A draft survey report entitled "Review of Reports for Flood Control and Allied Purposes," submitted to the North Central Division of the Corps of Engineers (NCD) on 1 September 1964 recommended three flood protection measures on Cazenovia Creek. A revised draft was submitted to NCD in April 1967. NCD requested additional information on project formulation and further study of the feasibility of reservoirs. Since the State of New York was also studying the feasibility of reservoirs at that time, the Corps elected to delay preparation of its report pending the results of the State's study. However, the State's report, completed in December 1969, did not provide sufficient information to complete the Corps' report.

A floodplain information report on Cazenovia Creek within the City of Buffalo and Town of West Seneca was completed in October 1966 by the Corps of Engineers and presented to the Erie County Department of Public Works, the requesting agency.

In October 1968, two consultant engineering firms, Harza Engineers and Greeley and Hansen, prepared a report entitled "Erie-Niagara Basin Comprehensive Water Resources Plan, Alternatives for Water Resources Development." The report was the basis for a report printed the following year by the State of New York entitled "Erie-Niagara Basin Comprehensive Water Resources Plan, Main Report." The report presents a plan for water resources development in Western New York and was published by the Erie-Niagara Basin Regional Water Resources Planning Board in December 1969. The Corps of Engineers participated in the State study under the provisions of Section 214 of the 1965 Flood Control Act. The report summarizes findings of investigations that identified needs, available resources, and opportunities for development.

A public meeting was held by the State of New York Department of Environmental Conservation on 29 June 1971 to obtain the views of local interests on various plans and alternatives presented in the report. On 28 October 1971, the State prepared a brief report based upon the opinions expressed at the public meeting and concluded that, of the plans presented in the report, only those involving multipurpose reservoirs met with significant opposition.

A feasibility report on the use of industrial wastewater to relieve ice jamming in Cazenovia Creek was prepared by the City Survey Divison, Department of Public Works, for the City of Buffalo, and submitted to the Commissioner of Public Works in May 1962. The report found the proposal to be practicable and recommended that measures to utilize the heated wastewater be implemented. However, this proposal has not been implemented because a detailed study found the measure economically unjustified.

In September 1959, the consultant engineering firm of Nussbaumer, Clark & Velzy prepared a report for the City of Buffalo, entitled "Study of Cazenovia Creek within the City of Buffalo, New York." The investigation considered flood management improvements to reduce damages within the City of Buffalo. The report concluded that upstream reservoirs would be necessary to prevent flooding, but that other measures, including channel improvements, bank clearing and/or paving, and levee construciton, could be accomplished by the city and would significantly reduce flooding within and just upstream of the city limits. With the exception of the upstream reservoir, most of the report recommendations have been or are being implemented.

A report on flood management measures for Cazenovia Creek within the City of Buffalo was prepared by DeLeuw, Cather and Company and presented to the City of Buffalo, Department of Public Works, the requesting agency, in February 1974. The recommended measures included channel improvements, dredging, and installation of backflow gates on sewer outlets. A dike system in Cazenovia Park was recommended to prevent flooding during periods of severe ice jamming. The city is planning to do some dredging and to extend slope walls in accordance with the report findings.

A Type 15 Flood Insurance Study was completed by the Corps of Engineers in September 1972 for the Village of East Aurora. Another Type 15 Flood Insurance Study for the Towns of West Seneca, Elma, and Cheektowaga was completed by the Corps of Engineers in February 1974. The report identified the flood hazard area in West Seneca along Cazenovia Creek as delineated by the outline of a flood having a 1-percent chance of being equaled or exceeded in any one year. In order to insure that the flood protection possible with the selected plan is in fact provided, either the extent of floodplain infringement in Reaches 1, 2, and 3 of Cazenovia Creek found to be allowable in this study must be further restricted; or, should the findings of the study be used, then channel capacities in these reaches must be increased to compensate for infringement.

RESOURCES AND ECONOMY OF THE STUDY AREA

An understanding of the resources and developmental trends of a study area is necessary to comprehend present and future problems and needs and to formulate possible solutions thereto. This section presents the environmental setting, natural and human resources, and development and economy of the study area.

Cazenovia Creek, a large tributary of the Buffalo River, drains 138 square miles of central Erie County, New York. A basin map is shown on Plate 1. The creek is 39 miles in length. Approximately 17 miles above its confluence with the Buffalo River, near the Village of East Aurora, Cazenovia Creek divides into two branches. The East Branch originates approximately four miles north of Sardinia and flows NNW through farmlands, past the rural communities of Holland and South Wales and on to its confluence with the West Branch near East Aurora. The West Branch originates approximately four miles north of Springville and flows NNE through farm and wooded areas past Glenwood and Colden and on to East Aurora, where it joins the East Branch. The main stream follows a wandering northwestern course from this juncture, flowing through a steep-walled gorge in the Town of Elma on through suburban West Seneca to its confluence with the Buffalo River in the City of Buffalo. Tannery Brook, a flood-prone tributary of Cazenovia Creek, flows through East Aurora and joins the East Branch of Cazenovia Creek just south of the town's populous residential sector. The Cazenovia Creek Basin is one of three basins that comprise the Buffalo River Watershed which drains a total of 436 square miles. The other watersheds, Cayuga and Buffalo drain 126 and 149 square miles respectively. Cayuga Creek, Buffalo Creek, Cazenovia Creek and tributary streams are shown on Plate 1. Details of resources and economy of Cayuga Creek and Buffalo Creek Basins are not included in this report. The data related to the Cazenovia Creek Basin typifies the resources and economy of Cayuga Creek and Buffalo Creek Basins except for the Buffalo River section in Buffalo, NY which is intensively developed and industrialized.

For the purposes of this report, the Cazenovia Creek basin is divided into three parts: the upper basin, above the confluence of the East and West Branches; the central basin, including the Towns of Elma and Aurora and parts of the Town of Orchard Park; and the lower basin, comprised of South Buffalo and the Town of West Seneca. Flood damages are greatest in the lower basin and in the Village of East Aurora. Proposed remedial efforts would have their greatest overall impacts upon the lower and central basins. The lower Buffalo River Basin is also susceptible to flood damage if a SPF were to occur. The upper basin experiences relatively minor flood damages and would be little affected by downstream remedial measures. Therefore, its treatment in this report is brief.

ENVIRONMENTAL SETTING AND NATURAL RESOURCES

Weather data obtained from 12 stations in or near the Buffalo River basin, 8 of which are still in operation, reveal a humid continental climate. The average annual precipitation of all stations throughout the basin is 36.92 inches. Monthly averages for the twelve stations vary from a minimum of 2.53 inches in February to a maximum of 3.33 inches in May. The average annual snowfall in the basin is 82.3 inches, with the most snow falling in the upper and middle basin areas. The highest monthly average snowfall is 22.4 inches, occurring in January at Arcade. The average annual temperature in the basin area is 46.9 degrees Fahrenheit, with monthly averages ranging from 24.2 degrees Fahrenheit in January to 69.2 degrees Fahrenheit in July. The year-round prevailing wind direction is WSW, blowing in across Lake Erie.

Topographically, the creek basin is characterized by a series of nearly level plains rising to the south in a step-like manner, bounded by steep escarpments facing north. The East and West Branches of Cazenovia Creek have deeply eroded the northern edge of the Allegheny Plateau, the highest of these plains. Eroded materials are deposited on the Erie Plain where the creek becomes wide and sluggish and the channel partially obstructed by extensive shoals.

The great ice sheet of the last glaciation was responsible for the generally subdued topography and the glacial, fluvio-glacial, and lacustrine deposits in the study area. The thickness of these superficial deposits varies from a few feet to a drill-proven depth of over 130 feet north of East Aurora. The major units of overburden encountered in the study area include not only glacial till deposits, but also outwash deltaic and glacial lake deposits, and sediments deposited during the postglacial period. The bedrock sequence traversed by Cazenovia Creek is composed of 600 feet of predominatly dark grey and black shales of Middle and Upper Devonian age. Interbedded with the shales are numerous thin, impure limestone layers, and large calcareous concretions up to 6 feet in diameter.

Water supply for the City of Buffalo is obtained from Lake Erie through an intake located near the head of the Niagara River. The Town of West Seneca and the Village of Orchard Park presently receive their water from the Erie County Water Authority intake in Lake Erie in the Town of Hamburg, and within a year, the Village of East Aurora will receive its water from the same source. The remaining communities in the basin currently obtain their water supplies from wells and springs. Groundwater behavior in the unconsolidated deposits of the study area is extremely variable and has been documented by the New York State Water Resources Commission. Static water levels in overburden and bedrock are generally less than 20 feet below ground level. Overall water movements within the overburden are generally controlled by the gradient of the bedrock surface beneath, owing to the low permeability of this bedrock. A buried channel filled with over 130 feet of coarse ice-contact deposits forms a natural groundwater reservoir north of East Aurora from which four wells yield flows of 500 to 800 gallons per minute (gpm). Many lesser aquifers (water-bearing deposits) exist in the study area upstream of West Seneca and are tapped for local use.

Water quality in Cazenovia Creek is generally moderate except for branch headwaters which are good to excellent in quality, and within the City of Buffalo where toxic industrial pollution from the backwater of Buffalo River degrades water quality. Although Erie County is at present enforcing a ban on all phosphate laundry detergents, elevated nutrient (phosphate and nitrate) and fecal coliform bacterial levels are still a problem due to treated sewage effluent. The major municipal outfall is at the East Aurora Sewage Treatment Plant, with minor outfalls at the Holland and West Falls treatment plants. It is thought that eutrophication (biological enrichment) of the creek water is forestalled only by physical and spatial limitations, since the creek is generally too shallow and exposed, and its bed too barren, to support large populations of algae invertebrates, and fish.

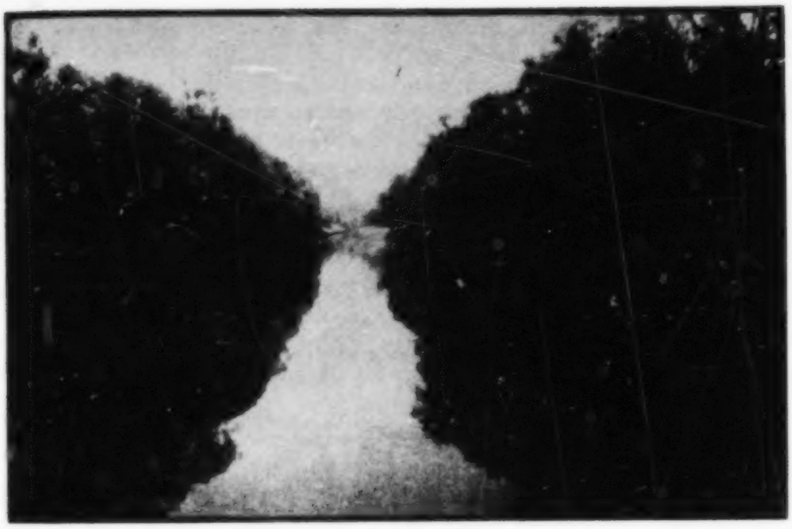
Air quality data have been compiled since 1966 by the Air Pollution Control Division of the Erie County Department of Health. High pollutional levels occur in the vicinity of and downwind from major industrial zones. In the Cazenovia Creek basin, air pollution problems are generally confined to South Buffalo and the northwestern corner of West Seneca.

Natural vegetation along Cazenovia Creek includes eastern deciduous tree species wherever soil is adequate and man's interference is minimal. The species growing in abundance alongside the streams, such as black willow, American sycamore, and eastern cottonwood, reflect the alluvial nature of the soils. Photographs on page 10 reflect this abundance of trees and vegetation along various sections of Cazenovia Creek. Reference to Plates 2 and 3 will aid the reader in locating areas and streets shown in the photographs. On the lower slopes of the Cazenovia valley, a yellow birch - American beech - sugar maple association has developed; while the upper slopes support oak-hickory climax stands of trees, reflecting the dry, excessively drained conditions. Common groundcover species along the creek include chicory, wild carrot, dandelion, burdock, and wild grape. Beyond the valley proper, the land is flat and intensely cultivated.

Much of the natural vegetation in West Seneca and Buffalo has been sacrificed during residential and commercial development. Floodplain development has occurred along the lower reaches. Streambank vegetation has been entirely removed in some areas due to commercial and residential development. However, many large trees and shrubs do remain as is shown in the top photograph on page 11. Immediately downstream from West Seneca, the creek flows through Cazenovia Park, a 192-acre recreational area where many fine trees of various species are preserved (see lower photograph on page 11).

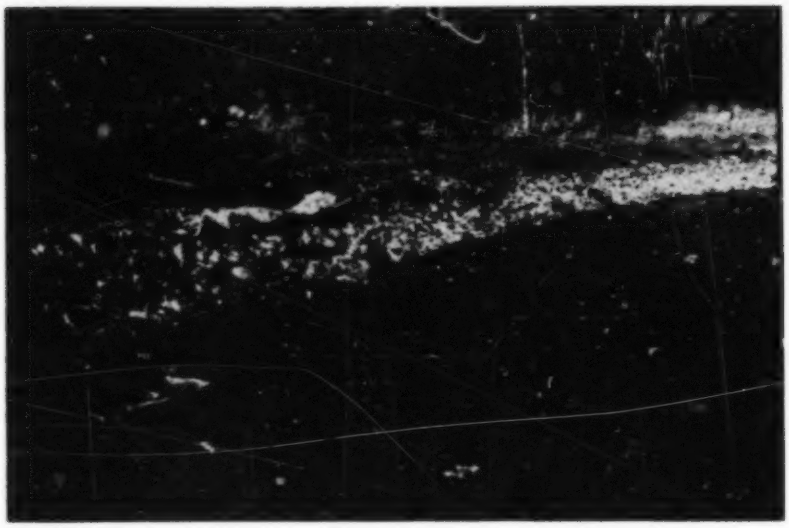
Although much of the creek bottom is bedrock, sizeable areas are covered with aquatic plants. Algae are found in various sections of the creek as filament-like growths or as microscopic forms (diatoms and desmids) floating freely or found in the detrital material on the creek bottom.

Fish inhabiting Cazenovia Creek are of interest to local residents as a potential source of recreational pleasure. However, the creek in its present natural state is a poor source of game and pan fish. Surveys taken during the summers of 1958 and 1967 reveal that of the 20-odd species of fish in the main stream, 10 species are minnows. The most numerous large fish are the northern hogsucker and white sucker. Members of the highly desirable bass and sunfish family are found sporadically,



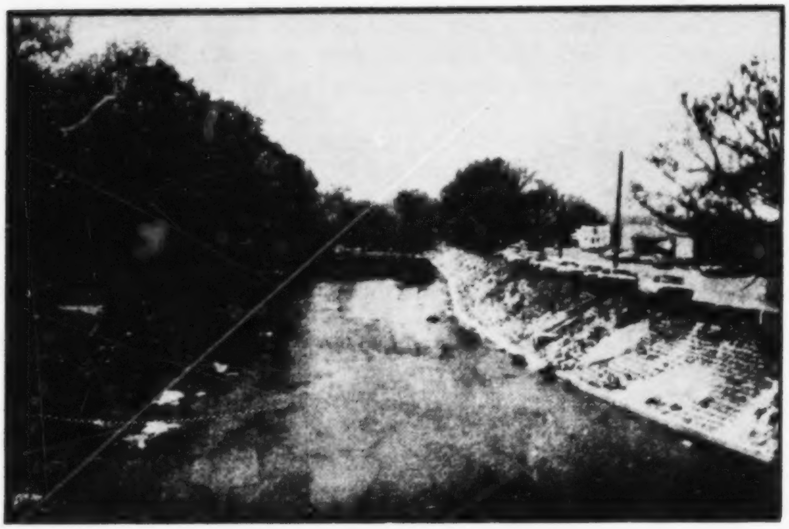
CAZENOVIA CREEK BELOW CAZENOVIA STREET
WITHIN THE BUFFALO CITY LIMITS

View looking upstream towards Cazenovia Street Bridge showing the abundance of vegetation along both banks.



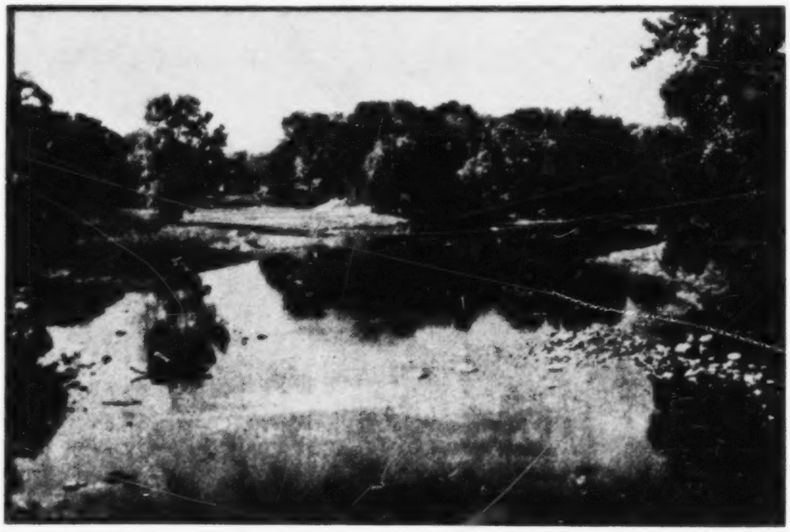
CAZENOVIA CREEK BY MILL ROAD
PARK IN WEST SENECA

View from the Mill Road Bridge showing the varied vegetation and trees along Cazenovia Creek in Mill Road Park.



CAZENOVIA CREEK BY SOUTHGATE
PLAZA IN WEST SENECA

View from the Union Road Bridge looking downstream showing the depletion of trees and vegetation due to commercial development.



CAZENOVIA CREEK IN CAZENOVIA PARK
WITHIN THE BUFFALO CITY LIMITS

Looking downstream from Green Street Bridge showing the various species of trees and extensive recreational area within the park.

while trout are found only in the upper East Branch above Holland. In a 1967 study of fish and wildlife, the New York State Department of Environmental Conservation (DEC) concluded that cold-water fish, such as trout, are limited due to high summertime temperatures, unsuitable streambed, and lack of cover; while warm-water fish, such as the bass, are limited by extreme overall shallowness and the absence of large deep pools.

Some 45 species of mammals occur in the Western New York region. Representative mammals of the Cazenovia Creek basin include white-tailed deer, beaver, woodchuck, gray squirrel, muskrat, cottontail rabbit, red fox, gray fox, skunk, and racoon. Surveys by the Buffalo Ornithological Society indicate that some 372 different species occur in the Buffalo area. Snipe, crow, woodcock, wild turkey, ring-necked pheasant, and a variety of songbirds (robin, sparrow, etc.) are among those which may be seen in the basin.

Cazenovia Creek has considerable scenic value. Upstream from Union Road, the stream rises rapidly, eroding its bed and creating a steep-walled gorge. Vertical outcroppings, initially along the south bank and varying with the meanders of the creek further upstream, create a rugged and very picturesque gorge, particularly in the Elma section. This gorge generally continues upstream along the West Branch to the hamlet of West Falls. Rock is exposed in portions of the stream channel at numerous locations, and the rate of flow is quite rapid. The East Branch, after winding past the Village of East Aurora, flows through relatively level terrain and develops extensive meanders with shallow embankments.

Municipal wastes from South Buffalo and West Seneca are ultimately handled by the City of Buffalo treatment facilities. The Town of Aurora's needs are serviced by the Village of East Aurora Treatment Plant. A small plant is operated in West Falls. Untreated effluent is discharged by the hamlet of Holland from its septic tanks directly into Cazenovia Creek. Under a state-adopted water resource development plan, these effluents will be pumped to an enlarged East Aurora facility.

HUMAN RESOURCES

The early human habitation of the area may be divided into American Indian and Early Settler Periods. The presence of Iroquois Indians and the Buffalo Creek Indian Reservation delayed European settlement until about 1844. The indian occupation of the study area prior to the 18th Century was by an Iroquois group, the Erie. Their occupation ceased about 1650 A.D. They can be traced back into prehistoric times, where there is a long, probably uninterrupted occupation back to at least 3000 B.C. A number of pre-reservation archaeological sites are reported between Cazenovia Street and Mill Road in West Seneca. Since the Cazenovia Creek valley has never been systematically surveyed for archeological sites, it seems likely that those reported are only a fraction of the ones present. Buried occupations might be expected in bottomlands like those from Transit Road west.

The Buffalo Creek Reservation was established in 1797 at the Treaty of Big Tree and included 83,557 acres surrounding the Iroquois settlements on the Buffalo River. The population of the Reservation was predominantly Seneca. A number of Cayuga and Onondaga had their own settlements and ceremonial longhouses. There were also Stockbridge from Massachusetts and Delaware from Pennsylvania. These Indians lived in clusters of cabins or in linear arrangements of houses spread out along the trails of which Seneca Street was the main one. This area was one of the centers of activity on the old Buffalo Creek Reservation. The Onondaga village of Big Sky, consisting of 28 cabins, was scattered along here in 1791. This centered around the old ford, now the bridge on Ridge Road which connects Potters Road to Seneca Street. In 1826, over one-third of the Buffalo Creek Reservation was sold, including the Mile Strip off the southern margin. This sale had little immediate effect upon European settlement, since only two small communities founded by early settlers lay just south of the Reservation. These were Willink (East Aurora) and East Hamburg (Orchard Park), whose communication lines were through the Reservation to Buffalo. Between 1844 and 1846, the remainder of the Buffalo Creek Reservation was sold to settlers and most of the Indians moved away, opening the area for quick settlement. A German communal group known as the Inspirationalists purchased a tract of about 5000 acres. In 1846, they incorporated the Village of Ebenezer (now the Gardenville area). At the same time, other settlers founded the villages of West Seneca, East Seneca, Reserve, Gardenville, and Winchester.

The Hart family bought a large parcel of land covering both sides of Cazenovia Creek in what is now South Buffalo. Part of this land is the present-day Cazenovia Park. The Hart holdings were subdivided among members of the family in the late 19th century. This period was also marked by extensive collecting of Indian artifacts by amateur collectors. Extensive surface collections now at the State University of New York at Buffalo show evidence of several Archaic occupations, including an Early Woodland Meadowood, an early Late Woodland Hunters Home, and a prehistoric Erie Iroquois village.

The birthplace of Millard Fillmore, 13th President of the United States (1850-53), is located in East Aurora. This site has recently been included in the National Register of Historic Places.

U.S. Bureau of Census population data for 1970 and Erie and Niagara County Regional Planning Board (ENCRPB) population projections for 1980-2000 for the Cazenovia Creek basin communities are presented in

TABLE 1

POPULATION IN CAZENOVIA CREEK BASIN, 1970-2000

AREA	1970		1980		1990		2000	
	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population
South Buffalo[1]	45,015	27.5	40,450	21.0	37,565	16.8	36,515	14.5
West Seneca	48,404	29.5	60,765	31.5	73,725	33.0	82,035	32.6
Elma	10,011	6.1	11,580	6.0	13,155	5.9	14,770	5.9
Aurora	14,426	8.8	16,065	8.3	18,735	8.4	21,335	8.5
Orchard Park	19,978	12.2	33,175	17.2	44,950	20.1	57,265	22.7
Boston	7,158	4.4	8,400	4.4	9,675	4.3	11,135	4.4
Colden	3,020	1.8	3,500	1.8	3,970	1.8	4,510	1.8
Holland	3,140	1.9	3,935	2.0	4,735	2.1	5,535	2.2
Wales	2,617	1.6	3,120	1.6	3,660	1.6	4,220	1.7
Concord	7,573	4.6	9,115	4.7	10,065	4.5	11,315	4.5
Sardinia	2,505	1.5	2,655	1.4	2,870	1.3	3,225	1.3
TOTAL	163,847	99.9 (2)	192,760	99.9 (2)	223,105	99.8 (2)	251,860	100.1 (2)

Notes:

(1) South Buffalo defined as Buffalo Projection Boundary Area 2 (Census Tracts 2, 6, 7, 8, 9, 10, 11) by Erie-Niagara Counties Regional Planning Board; all other areas are defined by their respective townships.

(2) Percentages may not add to 100.0% due to rounding.

Sources:

N.Y. State Dept. of Commerce, Business Fact Book, Buffalo Area, Part 2, Population and Housing (Albany N.Y. State Dept. of Commerce, 1963), 1940-1960 data, Erie-Niagara Counties Regional Planning Board Regional Population Projections (Grand Island, N.Y.: Erie-Niagara Counties Regional Planning Board, 1972), 1970-2000 data.

Table 1. The total basin population in 1970 was 163,847. This figure is projected to rise to 251,860 by the year 2000. The Towns of Elma, Aurora, Boston, and West Seneca are expected to contribute heavily to this growth.

The Buffalo District, Corps of Engineers conducted a cultural resource reconnaissance study of the proposed Cazenovia Creek project area, including the proposed ice retention structure site and stilling pool area, in September 1975. The study, which included literature research and a field reconnaissance, was under the direction of a Corps archaeologist working in cooperation with the New York Archaeological Council.

Staff members of the New York State Office of Parks and Recreation, Division of Historic Preservation, representing the New York State Historic Preservation Officer, were contacted by the Corps archaeologist in September 1975. The State representatives indicated that there are presently no properties in the project area that are either listed on, or are being nominated to, the National Register of Historic Places.

Socioeconomic data, including data on education and income for the creek basin communities, the county, and the State are given in Table 2. Since the upper basin experiences little serious flood damage and would be little affected by proposed remedial measures downstream, its treatment here is brief.

The communities of the upper basin are rural population centers amid extensive agricultural areas and woodlands. On the West Branch, the largest of these are Glenwood and Colden in the Town of Colden and West Falls in the Town of Aurora. On the East Branch, major communities include Holland in the Town of Holland and South Wales in the Town of Wales.

The communities of the central basin, including the Village of East Aurora in the Town of Aurora and Elma in the Town of Elma, are socioeconomically quite similar, as evidenced by the data presented in Table 2. They are suburban towns sharing an attractive wooded locale. The Village of East Aurora, with a population (1970 census) of 7,033, is a small residential community. Population growth, though considerable, is less than in neighboring locales due to limitations on available land. Mean and median income figures (see Table 2) suggest a skewness that indicates high income families. The 1970 census data reveal numerous families in the $50,000+ income bracket. Educational attainment is high with over 25 percent of the adult population having completed four or more years of higher education. Many residents of the village hold professional, educational, managerial, and sales positions. The Towns of Elma and Aurora are essentially rural communities, but are undergoing rapid suburbanization in their western sectors. They are basically identical in terms of area (35.1 square miles and 36.8 square miles for Elma and

TABLE 2

GENERAL SOCIOECONOMIC DATA FOR CAZENOVIA CREEK BASIN COMMUNITIES, 1970

Community	Median School Years Completed	Median Income of Families ($)	Mean Income of Families ($)	% Families Below Poverty Level	% Unemployment	Median Home Value ($)	Model Home Value Class ($)	Community Mobility	U. S. Census Tract Number
South Buffalo	11.0-12.1	9,193-10,144	9,926-11,342	1.2-5.9	3.5-4.6	13,100-14,200	10,000-15,000	n.a.	
West Seneca (T)	12.1	11,751	12,274	3.2	1.7-4.5	14,400-22,900	25,000-30,000	11.9	
Elma (T)	12.3	12,404	13,393	4.1	1.8	23,750	25-35,000	8.9	
West Elma (U)	12.1	11,612	11,732	6.2	1.8	21,600	25-35,000	n.a.	141.02
East Elma (U)	12.5	13,231	15,085	2.0	1.9	25,900	25-35,000	n.a.	141.01
Aurora (T)	12.6	12,192	14,346	3.1	1.7	23,800	25,35,000	13.0	
East Aurora (V)	12.6	11,900	14,260	3.0	4.2	20,700	15-20,000	n.a.	139 and 140
Orchard Park (T)	12.4	12,419	15,883	3.3	3.3	23,800	15-20,000	11.6	135
Boston (T)	12.3	11,349	12,002	3.4	3.0	22,200	15-20,000	10.6	152.01
Colden (T)	12.1	9,840	10,778	4.4	5.5	18,700	15-20,000	10.2	151.01
Holland (T)	12.3	9,657	10,115	8.3	5.7	18,500	15-20,000	14.6	150.03
Wales (T)	12.2	10,867	11,341	8.6	2.5	20,500	15-20,000	11.7	150.02
Concord (T)	12.1	9,734	10,715	5.7	3.7	15,800	15-20,000	14.8	158
Sardinia (T)	10.4	9,886	10,757	5.1	5.1	15,400	10-15,000	20.0	151.02
Erie County	12.0	10,482	12,205	6.9	4.4	18,500	15-20,000	15.8	
New York State	12.1	10,617	12,498	8.5	3.6	28,200	25-35,000	15.4	

Sources: U. S. Government Printing Office, 1970 Census
New York State Office of Planning Services, 1970 Census Socio-Economic Profile (Albany: New York State Office of Planning Services, 1973)

New York State Office of Planning Services, Selected 1970 Census Statistics for New York State Minor Civil Divisions (Albany: New York State Office of Planning Services, 1973)

Notes: n.a. - not available (V) - village
(T) - town (U) - unincorporated

Aurora respectively), physical setting, income base, and educational attainment (see Table 2). Historically, farming has played an important role in these communities, but in recent years has declined dramatically due to skyrocketing land values and tax rates. Long-established residents are rural/agriculturally-oriented and newer residents are suburban/professionally-oriented.

The lower basin includes the major population centers of West Seneca and South Buffalo. West Seneca is one of the fastest growing communities (in terms of population) in Western New York. Once a rustic agricultural community, West Seneca is becoming suburbanized rapidly as need for new housing and increasing land and tax valuations render farming decreasingly profitable. Census figures indicate West Seneca's population was 48,404 in 1970. If growth projections are realized, the town's 21.6 square miles will attain a population of over 80,000 by the year 2000. From social and economic standpoints, West Seneca is a typical lower middle to middle income suburb, absorbing a large portion of the urban outward migration. Population mobility is nonetheless considerable, with turnover between 1965 and 1970 ranging as high as 30 percent in individual census tracts (see Table 2). Occupationally, the townspeople are a heterogeneous mix of blue and white collar workers, including many in service-oriented professions. South Buffalo is primarily a residential area, reporting a 1970 population of 45,015. Census figures indicate that blue-collar workers are heavily represented in the area's labor force. Many residents are employed by nearby industries, such as the Republic and Bethlehem Steel plants. Housing density is high due to the small size of individual plots. Except for Cazenovia Park, open land is virtually nonexistent along Cazenovia Creek in South Buffalo and floodplain development is extensive. Population growth is expected to be slow.

DEVELOPMENT AND ECONOMY

Existing land uses in the Cazenovia Creek basin follow a typical pattern: agricultural uses are supplanted by residential, commercial, and eventually industrial development radiating outward from the central hub of activity, in this case, Buffalo. Upper basin communities are now undergoing the process of urbanization, as farmlands are subdivided for residential use.

At present, the most concentrated residential, commercial, and industrial developments are in the lower basin. With the exception of small industrial parks in Elma, Orchard Park, and West Seneca, basin industry is confined within the Buffalo city limits. Heavy industry is actually located downstream of the Buffalo River-Cazenovia Creek confluence, and hence out of the study area proper. However, there is strong economic interaction between these heavy industries (such as

Republic Steel) and the lower basin communities. The lower basin itself is the site of many warehouses and some light industrial development. Commercial development is quite extensive in the lower basin and is concentrated along major thoroughfares such as Seneca Street and Union Road. For example, Southgate Plaza is located at the junction of these roads in West Seneca.

There are a variety of recreational facilities in the study area, including town and county parks. Cazenovia Park in South Buffalo includes several baseball diamonds and a golf course and provides opportunities for picnicking in summer and sledding in winter. Mill Road Park in West Seneca provides picnic facilities in the setting of a scenic gorge. Facilities for skiing and tobogganing are available in the upper portions of the basin where, in addition, Emery Park in South Wales and Sprague Brook Park in Concord provide camping, hiking, and picnicking opportunities. West Seneca is the site of several bowling alleys and a proposed indoor ice rink complex.

Urbanization and the decline of agriculture is expected to continue in the basin. According to the Erie and Niagara Counties Regional Planning Board (ENCRPB), all of the lower and central basin will become urbanized by 1990. Small industrial parks in West Seneca, Elma, and Orchard Park may reasonably be expected to expand. The open land in West Seneca bordering Cazenovia Creek is zoned for residential or commercial development, including the proposed development of an apartment complex and an ice skating facility.

Future recreational developments might be in accordance with the Parks, Recreation and Open Space Study Plan, completed in 1969 by the Erie and Niagara Counties Regional Planning Board, which noted that the shortage of open space in Erie and Niagara Counties could, without remedial action, become more significant in the future. The report noted that open space in outlying areas would have to be acquired to supplement the parkland needs of more intensely developed areas. The study recommended public acquisition and control of open space land along streams such as Cazenovia Creek and in forest areas for use as linear environmental corridors.

Improved Federal, State, county, and town highways provide access to and within the Cazenovia Creek watershed (see Plate 6). The Interstate Thruway, Aurora Expressway, Route 16, and Route 219 are the main arterials connecting the City of Buffalo to the outlying portions of the watershed. Union and Transit Roads are also important north-south thoroughfares. A line of the Baltimore and Ohio Railroad follows the upper valley of the West Branch in a north-south direction, a line of the Lehigh Valley Railroad crosses the basin in West Seneca, and lines of the Penn Central Transportation Company Railroad cross the valley in north-south and east-west direction. Several commercial airlines serve the area from facilities at the Greater Buffalo International Airport in Cheektowaga which is accessible from anywhere in the study area.

FLOOD PROBLEMS AND FLOOD MANAGEMENT NEEDS

Flooding is the paramount water-related problem in the Cazenovia Creek basin. This section deals with the flood history of the study area, including notable hydrologic events; the potential for damage in the event of future floods; and the desires of local interests with regard to flood management improvements. Other water amd related land problems and needs in the basin, such as water quality and supply, public health and safety, fish and wildlife conservation, and water- and land-based recreation, will be subjects of a subsequent comprehensive study, which will be part of the Buffalo Metropolitan Area Study.

HYDROLOGY FOR CAZENOVIA CREEK BASIN

A continuous recording gage is operated by the United States Geological Survey (U.S.G.S.) on Cazenovia Creek near Ebenezer in the Town of West Seneca. The gage, located approximately 50 feet upstream from the Ridge Road Bridge, has been in operation since 1941 and measures the flow from the 134-square mile drainage area upstream of the gage. Ten square miles of the Cazenovia drainage basin are downstream of the gage. The results of the Ebenezer gage are good in summer, but are not reliable in winter and spring, due to backwater created by ice jams further downstream. In addition to this gage, high water marks, such as those evidenced on the Cazenovia Street Bridge, were also employed in this study.

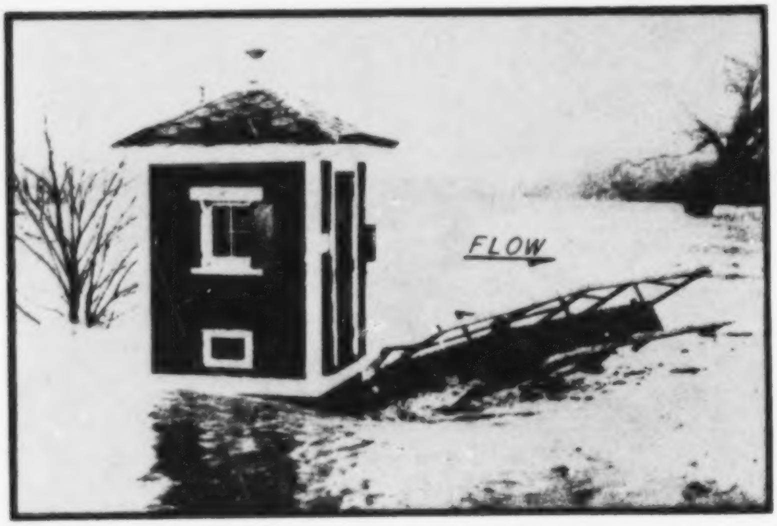
Damaging flooding along Cazenovia Creek generally occurs during late winter and early spring when major runoff events from snowmelt and rainfall on frozen ground frequently combine with ice jamming. Local flooding, particularly in the lower developed portion of the basin is often aggravated by ice jams that cause higher than normal stages. Discharges that would be non-damaging under ice-free conditions have resulted in severe flood damages when ice jams temporarily dam the channel.

Flooding has occurred in February and March 1904, January 1929, June 1937, March 1942, March 1955, March 1956, January 1959, January 1962, March 1964, February 1965, September 1967, December 1969, January 1970, and March 1972 (see photographs on pages 20-22). The maximum discharge on record, 13,500 cfs, occurred during the flood of March 1955.

General climatological information for the Cazenovia Creek basin is discussed in the section on the Resources and Economy of the study area. Specific storms that resulted in flood conditions in the basin occurred

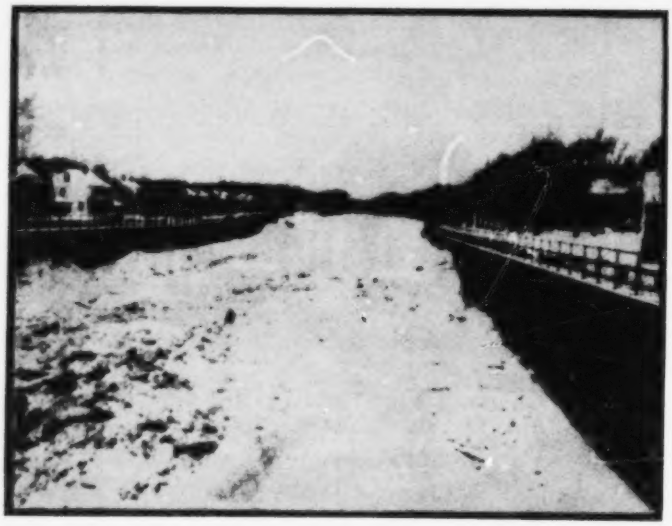
CAZENOVIA CREEK BELOW THE RIDGE ROAD
BRIDGE IN WEST SENECA

Floodwaters surrounding a home on Seneca Street, near mile 4.0 during the March 1955 flood.



CAZENOVIA CREEK JUST UPSTREAM FROM THE
RIDGE ROAD BRIDGE IN WEST SENECA

Looking from the right to left bank at the gage house at mile 4.1 during the March 1955 flood.



CAZENOVIA CREEK BELOW CAZENOVIA STREET
WITHIN THE BUFFALO CITY LIMITS

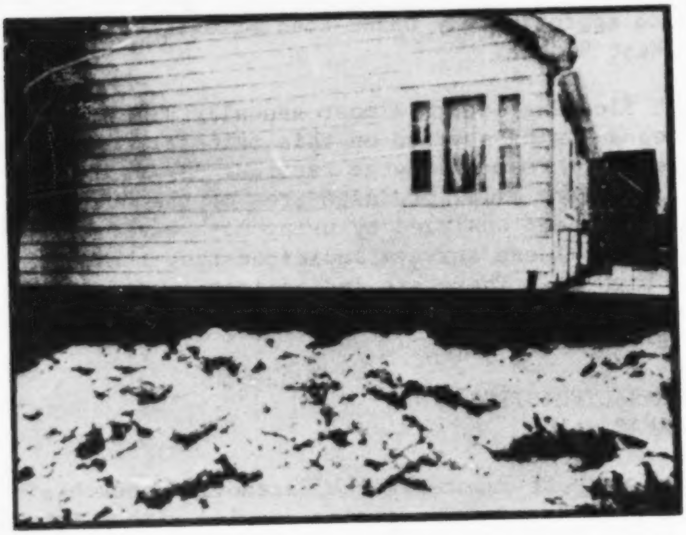
Ice jam just downstream of the Cazenovia Street Bridge during the January 1962 flood.

CAZENOVIA CREEK BY CREEKWARD DRIVE IN WEST SENECA

Ice deposits from the January 1959 flood near mile 5.8. Mill Road Bridge is seen in the background.

CAZENOVIA CREEK BY WEST WILLOWDALE
DRIVE IN WEST SENECA

Looking downstream between Cazenovia Creek and West Willowdale Drive during the February 1965 flood. Area is near mile 5.4.



CAZENOVIA CREEK BY FAIRFAX DRIVE IN WEST SENECA

Damage from the January 1962 flood along Fairfax Drive at mile 3.5. Note cave-in of basement wall.

in June 1937, March 1942, March 1955, March 1956, January 1959, September 1967, January 1970, and March 1972. Certain of these storms are discussed below.

On 1 March 1955, a thunderstorm caused heavy rains to fall on frozen ground for a period of six hours. Only a trace of snow was reported on the ground on the days preceding the rainfall. This storm resulting in the maximum recorded discharge on Cazenovia Creek, 13,500 cubic feet per second (cfs).

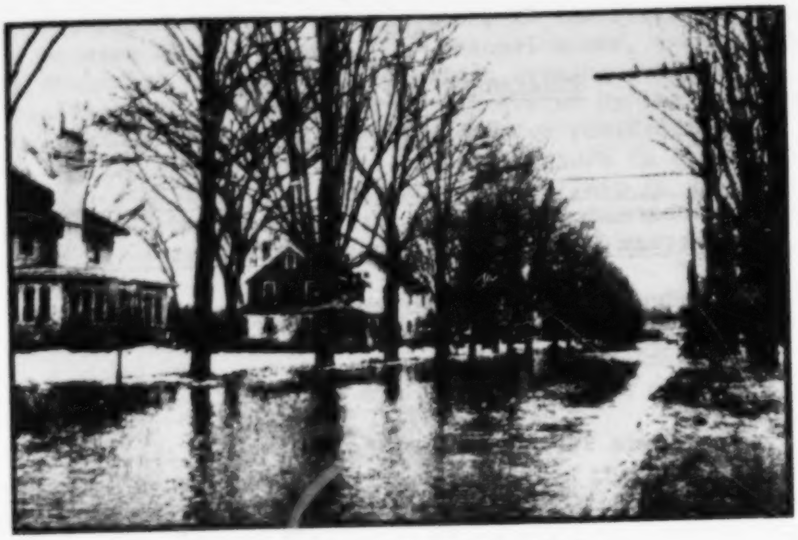
On 20 January 1959, a major storm system developed over the central and south central states and moved northeastward bringing heavy rainfall over Western New York on 21 January. On 21 and 22 January, the 9-inch snow cover melted rapidly from the heavy rainfall and temperatures in the 50's causing heavy runoff. Flood conditions were further aggravated when the thick ice cover on the streams broke up, due to the high flows. Numerous ice jams occurred along the creek, especially near the Cazenovia Street Bridge in Buffalo and downstream of the Union Road Bridge in West Seneca.

On Wednesday, 1 March 1972, a low pressure system had developed and moved into the western Great Lakes region. A warm front extended eastward from the lower center through Western New York near the Pennsylvania border. High runoff occurred with temperatures in the 50's and moderate rainfall. The resulting high flows caused the ice cover on the creek to break up. An ice jam occurred just upstream of the Ridge Road Bridge to approximately Union Road Bridge, causing extensive flooding in West Seneca.

Although flooding occurs almost annually along Tannery Brook, there has never been a gaging station on this tributary of Cazenovia Creek, nor are there any stream discharge records. This may be due in part to the small (2.8 square mile) drainage area of the brook. Flooding on Tannery Brook has been analyzed by using high water marks established by field surveys. These surveys indicated that the March 1955 flood was probably highest. There are indications that ice jams raised the stages of the January 1959 and February 1961 floods to those of the 1955 flood in some reaches.

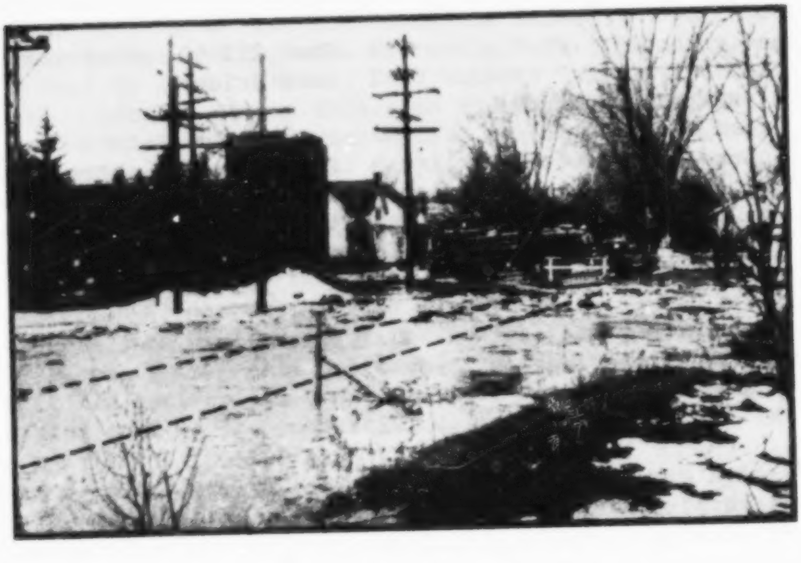
EXTENT AND CHARACTERISTICS OF FLOODED AREAS

Most large runoff events in the Cazenovia Creek basin result from rapid thawing of snow cover in spring coupled with rainfall. The steeply sloping terrain in the upper watershed and the steep bottom profile of the creek cause rapid runoff and widely fluctuating flows. The upper portion of the basin experiences comparatively little flooding and, when flooding does occur, the limited development results in



TANNERY BROOK BY GIRARD AVENUE
IN THE VILLAGE OF EAST AURORA

Looking east on Girard Avenue from Pratt Street during the March 1963 flood.



TANNERY BROOK ABOVE WHALEY AVENUE
IN THE VILLAGE OF EAST AURORA

Looking downstream to the Whaley Avenue Bridge during the March 1963 flood. The channel is approximately outlined by dashed lines.

TABLE 3

SUBREACHES AND INDEX POINTS FOR LOWER BASIN

Subreach	Downstream and Upstream Limits	Index Point Location
	Confluence with Buffalo River	
1A		Sta. 0+00, confluence with Buffalo River
	Cazenovia Street Bridge	
1B		Sta. 82+00, downstream of Green Road Bridge
	New York State Thruway Bridge	
2A		Sta. 130+00, upstream of NY State Thruway Bridge
	Orchard Park Road Bridge	
2B		Sta. 211+50, downstream of Ridge Road Bridge
	Ridge Road Bridge	
3A		Sta. 214+00, upstream of Ridge Road Bridge at Ebenezer gage
	Downstream of Parkside Drive (West Seneca)	
3B		Sta. 273+50, downstream of Southgate Plaza
	Downstream edge of Southgate Plaza	
3C		Sta 308+00, downstream of Mill Road Bridge
	Upstream of Mill Road Bridge	

relatively few flood damages. By contrast, in the lower portion of the basin, because of flat slopes, low channel banks, restricted and meandering channels, and constricted bridge openings, there is considerable flooding, often caused or aggravated by ice jams, which results in substantial damages to the extensive residential and commercial developments. The worst flooding occurs in the reach from downstream of the Cazenovia Street Bridge in Buffalo to upstream of the Mill Road Bridge in West Seneca. Flooding along Tannery Brook causes damages in East Aurora (see photographs on page 24).

To facilitate flood damage analyses and evaluations of alternative flood control measures, the primary damage area, located in the lower basin, was divided into reaches and subreaches (see Table 3 and Plate 2). Tannery Brook was similarly divided into damage reaches as shown on Plate 8.

Subreach 1A in the lower basin extends from the Buffalo River to the Cazenovia Street Bridge. Basement flooding can occur due to overland flow and storm sewer backup. In 1959, extensive damage occurred to residential development on the left floodplain between Portland and Cazenovia Streets. In this area, a discharge with a 100-year recurrence frequency under ice-affected conditions would affect 1,516 residential units, 3 with first-floor flooding; 108 commercial units, 17 with first-floor flooding; and 10 public and other units, 3 of which would experience first-floor flooding.

Subreach 1B extends from the Cazenovia Street Bridge to the New York State Thruway Bridge and includes Cazenovia Park. Flooding reached a depth of 3 feet in 1959 on Abbott Road between Cazenovia Street and Potters Road. Located within this area and on the south side of Abbott Road are residential and small commercial developments, a hospital, and a school. Except for residential developments between Woodside and Brookside Avenues north of Potters Roads, the area of this reach between Cazenovia Creek and Abbott and Potters Road is undeveloped and, therefore, the average annual damages are small.

Residences on Beyer and Willink Streets and Wildwood Avenue residence yards just downstream of the Lehigh Valley Railroad have been damaged by flooding. In this subreach, the 100-year ice-affected flood would affect 212 residential and 20 commercial units, causing first-floor flooding in 8 of the commercial units.

Subreach 2A extends from the New York State Thruway Bridge to the Orchard Park Road Bridge. The left floodplain of this subreach includes residential development, but the right floodplain is undeveloped. The 100-year ice-affected flood would affect 2 residential and 2 commercial units, causing first-floor flooding in all.

Subreach 2B extends from the Orchard Park Road Bridge to the Ridge Road Bridge. This subreach consists largely of undeveloped floodplain. Most flood damage occurs to commercial units and public utilities. The 100-year ice-affected flood would affect 2 residential and 2 commercial units, causing first-floor flooding in all 4.

Subreach 3A extends from the Ridge Road Bridge to just downstream of Parkside Drive in West Seneca. In this area the floodplain is largely undeveloped and the 100-year ice-affected flood would affect only 6 commercial units causing first-floor flooding in all.

Subreach 3B extends from just downstream of Parkside Drive to just upstream of Singer Drive. The right floodplain in this area is fully developed for residences. The 100-year ice-affected flood would affect 202 residential units and cause first-floor flooding in 47. A high bluff on the left bank prevents flooding in this area.

Subreach 3C extends from just upstream of Singer Drive to upstream of Mill Road. In this subreach, a bluff forms the left bank of the channel. Southgate Shopping Plaza has been constructed between Singer Drive and Union Road in the right floodplain. The right bank has been raised and protected in the same area. However, a flood stage equal to that of the 1959 flood would inundate the parking area around the plaza and cause business losses for the stores. Above Union Road a residential development occupies the right floodplain and units adjacent to the channel are occasionally flooded. In Subreach 3C, the 100-year ice-affected flood would affect 149 residential units, causing first-floor flooding in 15; and would cause business losses to Southgate Plaza stores.

Above Mill Road, Cazenovia Creek flows in a well-defined channel. There are scattered developments in the floodplain up to the community of Spring Brook. Between Spring Brook and East Aurora, the creek flows through a gorge in which there is virtually no development. Between East Aurora (where the East and West Branches join) and the hamlet of Griffin Mills, the West Branch of the creek flows in a deeply incised channel having a steep rock bank on one side and a more gently sloping till alluvium bank on the other. No significant flood damage has been reported in this area. Upstream of Griffin Mills, the channel is not so deeply incised and development has occurred along the banks, especially above Colden. Flooding along this stretch of the creek was reported in September 1967 when residential and commercial properties adjacent to the creek suffered flood damages. The most disastrous result of the flood was the drowning of a Town of Colden resident. Other damages included highway washouts and downed power lines. This flood affected 1 public, 1 commercial, and 10 residential units in West Falls; 6 residential, 1 public, and 3 commercial units in Colden; and 2 residential units in Glenwood. The East Branch flows through a wide valley and most development is high enough to avoid flooding, with only isolated

TABLE 4

STAGE-, DISCHARGE-, AND FREQUENCY-DAMAGE DATA FOR CAZENOVIA CREEK SUBREACHES UNDER EXISTING CONDITIONS

Subreach Index Point	Elevation at which Flood Damages Begin, Ft. Above Sea Level	Free Flow Conditions			Ice-Affected Flow Conditions		
		Maximum Nondamaging Discharge, cfs	Average Return Period Between Damaging Floods, Years	Total Average Annual Flood Damages, $/Year (1)	Maximum Nondamaging Discharge, cfs	Average Return Period Between Damaging Floods, Years	Total Average Annual Flood Damages, $/Year (1)
1A	581.6	33,000 (2)	30	50,500 (3)	33,000(2)	30	66,400 (4)
1B	592.2	15,200	55	1,300	9,000	15	9,500
2A	597.2	11,000	10	400	1,300	2.5	12,400
2B	616.1	7,000	2	1,600	7,000	2	1,700
3A	619.3	15,400	60	100	12,800	35	100
3B	628.3	17,100	125	100	1,700	3	96,100
3C	635.0	13,200	25	200	1,800	2.5	9,300
				54,200			195,500

(1) Based on October 1973 price levels
(2) Buffalo River at confluence with Cazenovia Creek
(3) Although the frequency of flooding along this reach is only once in 30 years, flooding is so widespread that the total damages are extensive, as this amount reflects.
(4) Includes $15,900 in annual costs for ice patrols by the City of Buffalo in subreach 1A.

residences close enough to the creek to be flood-prone. Although a county highway bridge in the Town of Holland was damaged during the September 1967 flood, recent floods have caused no reported damages to private property along this stretch.

Floods with less than a 100-year recurrence frequency could cause severe flood damage in the Cazenovia Creek Basin. The Cazenovia, Cayuga and Buffalo Creek watersheds comprise a majority of the Buffalo River Basin. The Buffalo River flows through an intensely industrialized area of the city of Buffalo before entering Lake Erie. The discharge from these three streams produce the flows in the Buffalo River. Development along Cayuga and Buffalo Creeks is similar to that along Cazenovia Creek. Most flood damages along Cayuga Creek occur in the town of Cheektowaga. Flood damages along Buffalo Creek occur, in the reaches, in the towns of Elma and West Seneca and in the city of Buffalo. The effect of floods greater than a 100-year recurrence along Cazenovia Creek and in the total Buffalo River Basin is discussed in the formulation section of this report.

PRESENT FLOOD DAMAGES

Both tangible and intangible damages and losses are experienced during flooding along Cazenovia Creek. Tangible damages and/or losses include: physical damage to flooded structures, utilities, and transportation facilities; flood-fighting costs; cleanup costs; business losses; and increased operating and living costs during a flood. Intangible losses include the social, phychological, and health problems that are associated with flooding.

Tangible damages and losses for the major damage areas along the lower portion of Cazenovia Creek were quantified by developing stage-damage relationships based on data from various sources, including damage surveys conducted by the Corps of Engineers in 1960 and twice in 1972. Three damage categories were considered--residential, commercial and public and other--and the results combined to get the total stage-damage relationship for each subreach at its selected index point. Table 4 presents data developed from stage-damage, stage-discharge, and discharge-frequency results. A similar analysis was conducted for Tannery Brook using stage-frequency relationships based on damage surveys by the Soil Conservation Service in 1956. This damage survey data was updated for recent developments and adjusted to October 1973 price levels. These results are in Table 5.

Except for the Tannery Brook subbasin, flood damages for Cazenovia Creek upstream of Reach 3 are infrequent and small in scope. A particular flood event might cause substantial damages, such as the damages along the East and West Branches from the September 1967 flood. However, the rareness of major flood events and the limited degree of development

TABLE 5

STAGE- AND FREQUENCY-DAMAGE DATA
FOR TANNERY BROOK UNDER EXISTING CONDITIONS

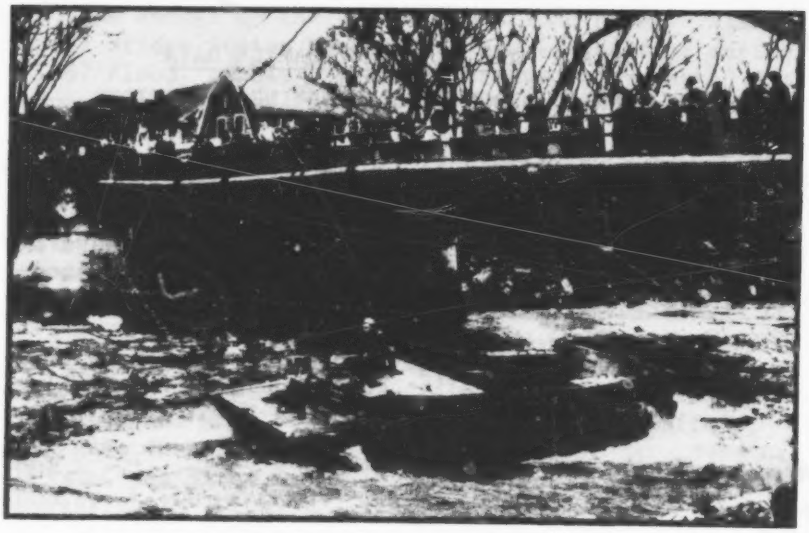
Reach Index Point	Elevation at which Flood Damages Begin, Ft. Above Sea Level	Average Return Period Between Damaging Floods, Years	Average Annual Flood Damages, $/Year*
1	918.8	Approx. 1	3,700
2	907.2	Approx. 1	7,700
3	895.5	2	4,600
			16,000

*Based on October 1973 price levels

in the upper basin result in relatively insignificant damages when considered on an average annual basis. Under these circumstances, it becomes obvious that major flood management measures are not economically feasible. However, in evaluating the effect of a SPF, the Cazenovia Creek Basin was considered as a subbasin of the Buffalo River Basin. Cazenovia Creek was not considered separately as it is only one of three major tributaries to Buffalo River. Cayuga and Buffalo Creek Basins were included in the analysis of flood damages associated with a SPF. The SPF has about a 1,000-year frequency of occurrence. A SPF in the Buffalo River Basin would cause total flood damages of $1,000,000,000 based on October 1974 price levels. These damages on an average annual basis are $3,750,000.

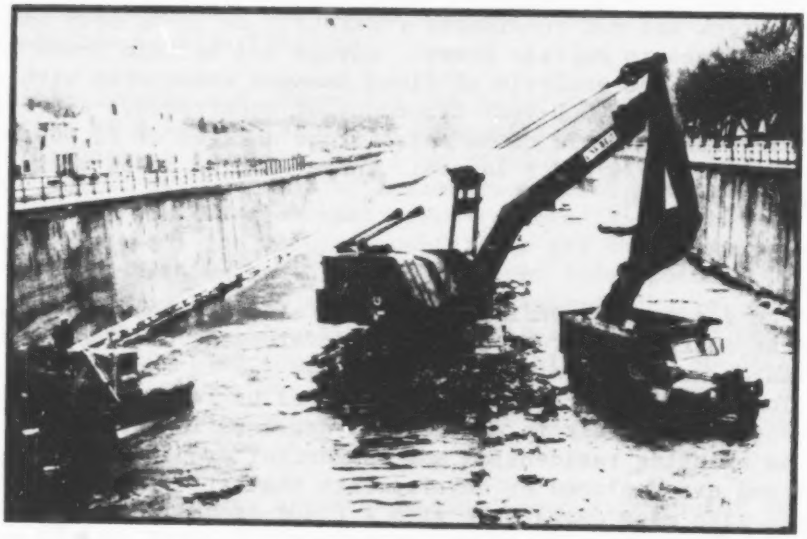
FUTURE FLOOD DAMAGES

Due to recent and pending Federal, State, and local legislation directed at controlling future use and development of flood-prone areas, flood damages are not projected to increase due to future encroachments on the floodplain. On the contrary, control of future floodplain development could result in an eventual decrease in physical flood damages as existing residential and commercial properties become obsolete and are replaced by developments that are floodproofed or associated with uses compatible with a flood-prone location. The possible decrease in physical damages might be offset, however, by improvements to existing developments. For instance, as residents experience continued growth in income, a part of this growth will probably be invested



CAZENOVIA CREEK AT THE CAZENOVIA STREET
BRIDGE IN THE CITY OF BUFFALO

Amphibious vehicles breaking up ice jams during the spring of 1963.



CAZENOVIA CREEK BELOW THE CAZENOVIA STREET
BRIDGE IN THE CITY OF BUFFALO

View during deepening of channel by the City of Buffalo in 1964. Note concrete-lined channel walls.

in improved and more expensive home furnishings. Similarly, industrial and commercial establishments wishing to increase production or sales will probably expand their facilities and invest in additional equipment. The effect of projected growth and improvement to existing development is explained in more detail in the benefit section of this report.

FLOOD EFFECTS ON PUBLIC HEALTH AND SAFETY

Major floods are detrimental to the health and safety of those inhabiting inundated areas. Floods present a threat of direct physical harm, including drowning, injuries, and electrical shocks. Other possible effects include disruption of local traffic, phychological reactions to flooding of one's home, subsequent immigration of vermin into flooded areas, and increased threat of disease.

STATUS OF EXISTING PLANS AND IMPROVEMENTS

Various improvements to Cazenovia Creek and Tannery Brook have been made both by Federal and local authorities with a view to providing flood protection at different locations. Reference to Plates 2 and 3 will aid the reader during the discussion of these improvements.

The City of Buffalo is involved in a program of removing willow trees from the banks of the creek downstream of the Cazenovia Street Bridge and lining the banks with concrete slope walls (see bottom photograph on page 30). This program was initiated in 1960 and is planned to be continued in the future. The intent of the program is to reduce the roughness along the creek banks to improve the hydraulic efficiency of the channel and to allow the ice to flow freely through this reach.

In the vicinity of the Cazenovia Street Bridge, vertical retaining walls have been constructed on both banks over a distance of 1,300 feet. A 3 foot high concrete dam originally constructed to maintain a recreational pool in Cazenovia Park was removed by the City of Buffalo in the winter of 1964-1965.

In 1960, the city constructed a levee along the left bank from Cazenovia Street to Green Road to prevent overbank flows in this reach. However, because the levee reduced valley storage and interfered with ice flow movement, the city removed the levee in 1965 and constructed a new levee set back from the bank. A levee along Beyer Street on the right bank was constructed in 1964.

Since 1963, the City of Buffalo has maintained an ice patrol on Cazenovia Creek. The main objective of this patrol is to report on ice breakup conditions in the creek and help prevent ice jams within the city limits. Amphibious vehicles break up the ice cover in the lower reaches of the creek to help the ice enter the Buffalo River and flow into Lake Erie (see top photograph on page 30).

In 1949, the Corps of Engineers completed a clearing and snagging project between Ridge Road and Mill Road at a cost of $24,900.

In 1971, the Corps of Engineers completed a clearing and snagging project in West Seneca upstream of Cazenovia Park at a cost of $44,000. This program included the removal of sand bars in the reach between the New York State Thruway and a point about 1500 feet above Mill Road.

Above Ridge Road the creek is contained on the left bank by a 30-foot high bluff. The right bank from the Union Road Bridge to a point 900 feet downstream was raised and protected by concrete bag riprap in 1960. A partial levee was constructed by a developer in 1963 extending for 600 feet from Sunbriar Drive towards Parkside Drive. Natural weathering and flooding have destroyed this levee. Riprap has been placed along the foot of the bank in various locations from Ridge Road to a point upstream of Mill Road by the Soil Conservation Service.

Upstream of Mill Road, improvements have been confined to measures taken by local agencies to counteract specific problems within their areas of jurisdiction. From Mill Road to the confluence of the East and West Branches of Cazenovia Creek near East Aurora, the creek is contained in a gorge and flood protection is not necessary. The Towns of Aurora and Colden have on various occasions carried out channel improvements along stretches of the creek. These improvements have included the removal of gravel bars restricting flow through various sections and causing bank overtopping.

Sections of the creek banks have been protected by riprap placed by the Soil Conservation Service. In addition, the County Soil and Water Conservation Districts, with S.C.S. assistance, are conducting vegetation planting programs for bank stabilization purposes.

In the West Branch, there have been no significant flood management improvements along the creek.

Flood control measures along Tannery Brook have included clearing and snagging by the Village of East Aurora in 1959 and replacement of two East Aurora bridges (Maple Road and Pine Street) by the Erie County Highway Department in 1963. In 1973, the village replaced the bridge on Riley Street and enlarged the culvert carrying Tannery Brook beneath the structure. During recent winters, East Aurora has discharged backwash water from water treatment plant softeners into the brook to prevent formation of ice. The village has also used an ice-breaking technique similar to that used by the City of Buffalo in order to keep the channel clear for spring runoff. These measures have proved reasonably effective.

IMPROVEMENTS DESIRED

Excerpts from the record of a public meeting held 11 December 1959 follow:

a. A member of the New York State Assembly felt that "The situation, especially in South Buffalo, is one that should be looked at carefully because the level of the creek bottom there is not much lower than the street." He asked "that a careful survey be made."

b. The County Supervisor, Third Ward, felt that "immediate corrective steps should be taken so as to prevent a recurring of what happened (on 21 January 1959)."

c. The Supervisor, Town of West Seneca, presented a petition from property owners on West Willowdale Drive, which outlined their opinion "that minimum corrective action taken should include: snagging and clearing debris; channel deepening; straightening and elimination of severe curves; contouring banks; and arranging a coordinated warning system."

d. The County Supervisor, Second Ward, presented a petition originated by the Cazenovia Creek Improvement Committee and signed by 5,300 persons within the immediate area of Cazenovia Creek, particularly in the south side of Buffalo. They requested that immediate action be taken "to prevent a repetition of the disastrous flood conditions which occurred on 21 January 1959."

e. The Mayor of East Aurora appealed "for whatever can be offered in the way of assistance to diverting the inherited water (from upstream on Tannery Brook) so that we can take care of our own (within the village limits)." The prepared statement indicated that a Soil Conservation Service proposal and study about 1956 "recommended construction of a shallow diversionary floodway connecting that portion of the Tannery Brook basin lying east of the corporate limits with a tributary of Buffalo Creek." The Soil Conservation Service made a study in 1967 and determined that a project could be justified, but local interests in the recipient watershed opposed the project.

f. The Cazenovia Creek Improvement Committee presented specific recommendations for improvement consisting of four main parts, which would provide for a small reservoir in Cazenovia Park and channel straightening upstream.

g. A representative property owner from the Wichita Road area indicated that they were "very much in favor of something being done to help so we will not suffer the inconvenience and loss we have had previously."

h. The United States Soil Conservation Service recommended that: the willow trees lining the channel along Legion Drive between Cazenovia Street and the mouth of Cazenovia Creek be trimmed extensively; snags and trees along the banks of Cazenovia Creek through the park be removed to reduce obstruction to flow; clearing and snagging be done between the park and Orchard Park Road; a dike be constructed around the perimeter of Cazenovia Park; and the retention of ice be increased in one or more areas between Orchard Park Road and Leydecker Road in the Town of West Seneca.

A public meeting was held by the State of New York, Department of Environmental Conservation, on 29 June 1971 to obtain the views of local interests on various plans and alternatives for water resource development in Erie and Niagara Counties. The report summarized investigations that identified available resources, needs, and opportunities and development. Some of the structural plans and alternatives presented in the plan included multi-purpose reservoirs, upland reservoirs, and channel improvement. On 28 October 1971, the State prepared a brief report based upon the opinions expressed at the public meeting. They concluded that no significant opposition was directed to the plans presented in the report except to some of the multi-purpose reservoir proposals including the one proposed for a site near Spring Brook.

On 28 August 1973, a meeting was held with the Southgate Homeowners Association of West Seneca to discuss possible flood control alternatives. Members expressed an earnest desire to alleviate damages and a willingness to embrace viable structural measures. In addition, several informal meetings and two formal public meetings (11 December 1973 and 21 June 1974) were held during the progress of this study. At each of these meetings one of the major viewpoints expressed, particularly by the members of the Southgate Homeowners Association, was that floodproofing by individual home owners was considered an unacceptable alternative. Generally, it was stated that the disruption of normal services and traffic flow during high water as well as the aftermath cleanup were undesirable aspects not solved by floodproofing.

FORMULATING A PLAN

GENERAL

On the basis of the problems and needs set forth in the preceding section of the report, this section presents the plan selection process and outlines the basic criteria used to formulate and select a plan. This section presents the logic for screening alternative plans and selecting a final plan that will meet the needs of flood management in Cazenovia Creek basin.

OBJECTIVES

A set of National objectives and planning goals was used as a general guideline for the formulation process. These objectives were identified from an analysis of the problems, needs, concerns, and opportunities within the study area. The objectives not only reflect National development and environmental quality objectives but also the objectives of local, State, and regional interests. The objectives used in the formulation analysis are as follows:

NATIONAL ECONOMIC DEVELOPMENT (NED). NED is achieved by increasing the value of the nation's output of goods and services and improving National economic efficiency.

ENVIRONMENTAL QUALITY (EQ). EQ is achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

PLANNING GOALS. Planning goals are the National, State, and local water and related land source management needs (opportunities and problems) specific to a study area that can be addressed to enhance NED and EQ. The overall planning goal for this study is to develop a comprehensive plan to satisfy the needs for flood management in Cazenovia Creek Basin with a minimum adverse effect on the environment and reduce tangible and intangible flood damages that include:

TANGIBLE

Physical damage to flooded structures, utilities, and transportation facilities,

Flood fighting costs,

Cleanup costs,

Business losses,

Increased operating and living costs during a flood.

INTANGIBLE

Social, psychological and health problems that are associated with flooding.

Because of its toll in terms of human suffering and economic losses, flooding is paramount among water and related land resource problems in the Cazenovia Creek basin. Thus, flood management is the greatest need in the study area. This section of the report is intended to aid the reader in following and understanding the screening and evaluation process whereby the initially large number of possible flood management measures was reduced and a comprehensive plan for reducing the basin's flood damages was developed. The technical, economic, environmental, and social criteria used during the selection and formulation process are discussed; and alternative solutions to the basin's flood problems are identified, screened for conformance with the selected criteria, and compared to develop the recommend plan.

The plan selection and formulation process is outlined below:

Step 1 is the identification of all plausible flood management measures, each measure consisting of individual structural or non-structural flood management improvements, such as a levee or a flood warning system with provisions for emergency protection. In addition, a "no action" measure is considered.

Step 2 consists of a preliminary qualitative screening of these measures to eliminate those which, after further consideration, are found to be unacceptable because of engineering impracticability, social unacceptability, economic infeasibility, or inability to provide an adequate solution to the flood problems. Typical results of such screening would be elimination of reservoirs from further consideration where there is inadequate flood storage, or elimination of permanent evacuation where public sentiment is strongly in opposition.

Step 3 is the identification of individual measures and/or reasonable combinations of measures that have passed the preliminary screening and would provide adequate degrees of protection in major damage areas. During this step, a combination of channel improvements and a levee might be identified as a reasonable means of protecting a particular urban area.

Step 4 is the first quantitative test - an economic evaluation of costs and benefits of each identified measure and combination of measures to determine which are economically feasible.

Step 5 involves the development of alternative plans, each plan consisting of compatible measures and/or combinations of measures providing a coordinated flood management program for the entire basin. For example, an alternative plan might consist of floodplain management and flood insurance for the entire basin, with an upstream flood detention reservoir to prevent damages at an existing downstream urban area which might also need levees to relieve the remaining flood threat.

Step 6 is the comparison of alternative plans on the basis of national economic development (NED), environmental quality (EQ), social well-being (SWB), and regional development (RD) parameters. This allows the planner to make trade-offs between these accounts. For instance, a plan that maximizes economic return but results in substantial environmental degradation could be rejected in favor of one with slightly reduced net benefits but considerably lesser environmental impact. The best alternative plan becomes the selected plan.

Step 7 involves formulating the selected plan for scale of development. The result is the recommended plan. For example, a selected plan which includes 100-year levee protection for a particular urban area might return more net benefits if the degree of protection for this damage area were increased.

FORMULATION AND EVALUATION CRITERIA

The principal purpose of the plan formulation studies conducted during this study was to develop and optimize a plan which would provide a solution to the major flood problems of the Cazenovia Creek basin and if possible to the Buffalo River Basin of which Cazenovia Creek Basin is a subbasin. In accordance with the Principles and Standards for Planning Water and Related Land Resources, as published in the Federal Register, Volume 38, No. 174, Part III, dated 10 September 1973, the principal planning objectives were maximizing national economic development and emphasizing environmental quality. Four accounts were considered including, in addition to national economic development and environmental quality, enhancement of social well-being and regional development. As discussed in detail below, specific planning criteria were derived from the Principles and Standards and other applicable directives.

Technical criteria were adopted from appropriate engineer regulations, manuals, pamphlets, and technical letters. Basically, the recommended plan must be engineeringly feasible, must be complete within itself and not require additional future improvements, and should insure against significant worsening of upstream or downstream flood conditions. Where practicable, the alternative measures considered for urban areas were designed to protect against a flood equal to or larger than one having a 1-percent chance of being equaled or exceeded in any one year (one whose recurrence interval over a long period of time will average 100 years, ie., a "100-year flood"). Consideration was also given to measures designed to protect against a Standard Project Flood in the Buffalo River Basin of which Cazenovia Creek Basin is a part. Criteria, such as freeboard and spillway capacity, and designs of project features, such as riprap and sideslopes, were based on appropriate Corps of Engineers design standards and considered existing and proposed conditions and available construction materials.

The economic criteria which were used in considering the national economic development objective were taken from Senate Document No. 97, 87th Congress, entitled "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources." These criteria specify that tangible benefits must exceed economic costs; each separable unit or purpose provides benefits at least equal to its cost except that incremental justification is not required to recommend improvements to protect against the SPF in an Urban Area; the recommended plan should maximize net benefits, although a plan providing less than the economic optimum can be recommended if appropriate gains in environmental quality or social well-being would result; and no more economical means, as evaluated on a comparable basis, of accomplishing the same purposes exist and would be precluded from development if the recommended plan was implemented.

Economic analyses for comparing alternative measures were based on October 1973 price levels, a 100-year economic life, and, in accordance with the Water Resource Development Act of 1974 (P.L. 93-251) approved 7 March 1974, an interest rate of 5-5/8 percent. The recommended plan was then reevaluated in terms of October 1974 prices and at an interest rate of 5-7/8 percent, as established by EC 1105-2-204, dated 6 September 1974. The plan selection and formulation results would not be changed by using the latter criteria throughout the analysis. An interest rate increase would increase annual costs but not benefits; thus, a project which was not economically feasible at a lower interest rate would become even less feasible as the interest rate increases. A project with a high benefit/cost ratio will remain economically feasible. A project that is marginally feasible might become infeasible. When price levels increase, costs and benefits generally increase in a similar fashion, thereby changing the economic feasibility little, if any.

The environmental and social criteria used in considering the environmental quality objective and the social well-being and regional developments accounts include the following requirements of the National Environmental Policy Act of 1969 (P.L. 91-190):

a. analysis of the environmental impact of the proposed action;

b. identification of any adverse environmental effects which could be avoided should the proposal be implemented;

c. evaluation of alternatives to the proposed action;

d. determination of the relationship between local short-term uses of man's environment and the maintenance and enhancement of long term productivity; and

e. accounting of any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Section 122 of the Rivers and Harbors Act of 1970 specifies that adverse economic, social, and environmental effects of proposed projects receive full consideration. Factors to be considered include:

a. air, noise, and water pollution;

b. destruction or disruption of man-made and natural resources, aesthetic values, community cohesion, and the availability of public facilities and services;

c. adverse employment effects and tax and property value losses;

d. injurious displacement of people, businesses, and farms; and

e. disruption of desirable community and regional growth.

The environmental objectives recommended in the Principles and Standards include:

a. management, protection, enhancement, or creation of areas of natural beauty and human enjoyment;

b. management, preservation, or enhancement of especially valuable or outstanding archeological, historical, biological, and geological resources and ecological systems;

c. enhancement of quality aspects of water, land, and air by recognizing and planning for the need to harmonize conservation of the resource with the land use objectives of productivity for economic use and development; and

d. development and use objectives which minimize or preclude the possibility of undesirable and irreversible changes in the natural environment.

These environmental and social considerations are covered in greater detail in the Environmental Impact Statement.

POSSIBLE SOLUTIONS

The measures considered for alleviating flood damages in the Cazenovia Creek basin included various structural and nonstructural measures. A "no action" measure was also considered. The measures are listed in Table 6. A system of reservoirs on Cayuga, Buffalo and Cazenovia Creeks was also considered to provide protection against a SPF in the Buffalo River Basin. The locations of the considered reservoirs are shown on Plate 1. The location of local protection work being considered for Cayuga Creek is also shown on Plate 1. No improvement work was found to be economically justified for Buffalo Creek.

TABLE 6

MEASURES CONSIDERED

1. NO ACTION

2. STRUCTURAL MEASURES
   a. Reservoirs
   b. Levees and/or floodwalls
   c. Ice retention structure
   d. Channel improvements
   e. Diversion channel

3. NONSTRUCTURAL MEASURES
   a. Flood warning and emergency protection
   b. Floodproofing
   c. Flood insurance and floodplain management
   d. Permanent evacuation

The Cazenovia Creek basin was divided into seven damage areas to allow consideration of the applicability and suitability of the measures listed for distinct reaches in the study area. The lower part of the basin, which suffers over 90 percent of the basin's average annual flood damages, was divided into three reaches, each of which was subdivided. Tannery Brook accounts for most of the remaining average annual flood losses in the basin.

The East and West Branches of Cazenovia Creek and the main stem upstream of the subdivided lower basin and downstream of the confluence of the branches experience only scattered and infrequent flood damages which, when considered on an average annual basis, are relatively insignificant.

The Buffalo River Basin was divided into four areas, the Cayuga, Buffalo, and Cazenovia Creek subbasins and the Buffalo River. Each of the subbasins experience some flooding each year. The greatest amount of damage has occurred along Cazenovia Creek and the least along Buffalo Creek. Most of the past flood damages occurred in the lower reaches of the three creeks. However, if a SPF occurred in the Buffalo River Basin, extensive flood damage would occur along the Buffalo River, since these three creeks are tributary to Buffalo River which flows through the most intensely developed area of the entire Buffalo River Basin.

The applicability and suitability of each measure listed in Table 6 was considered for these damage areas on the bases of engineering practicability, social acceptability, economic feasibility, and capability of providing an adequate solution to the area's flood problems. Table 7 presents a matrix showing the results of this preliminary qualitative screening.

For a measure to be economically feasible, the average annual benefits must equal or exceed the average annual costs incurred. As discussed previously, the East and West Branches and the main stem between the confluence of the branches and the lower basin experience relatively insignificant flood damages. Costly structural and nonstructural measures, such as levees or permanent evacuation, would not be economically feasible in these damage areas where average annual benefits (in the form of reduction in average annual flood damages) are very small. Consequently, these types of measures were rejected during the preliminary qualitative screening.

EVALUATION OF MEASURES

As shown in Table 7, a limited number of measures passed the preliminary qualitative screening. For Reaches 1, 2, and 3 of the main stem these included floodproofing, flood insurance and floodplain management, upstream flood detention reservoirs, levees and/or floodwalls, and an upstream ice retention structure. For the East and West Branches and the main stem between Reach 3 and the confluence of the two branches, only flood insurance and floodplain management passed the screening. For Tannery Brook, floodproofing, flood insurance and floodplain management, and the diversion channel appeared to warrant further consideration.

Step 3 of the plan selection and formulation process consisted of identifying individual measures and/or combinations of measures that would provide an adequate degree of protection in major damage areas. Table 8 and the following paragraphs describe the 13 combinations of measures that were identified as qualifying for economic evaluation.

As shown in Table 8, the flood insurance and floodplain management measure is assumed to be included with other individual measures and combinations of measures listed. Insurance for residual flood damages to existing developments would be available at federally subsidized rates; whereas flood insurance for future developments would be available

TABLE 7

PRELIMINARY QUALITATIVE SCREENING

FLOOD CONTROL MEASURE	Buffalo River Basin	DAMAGE AREAS						
		Cazenovia Creek						Tannery Brook
	Lower Reaches and the Buffalo River	Reach 1	Reach 2	Reach 3	Upstream of Reach 3 and Downstream of East and West Branch Confluence	West Branch	East Branch	
NO ACTION		6	6	6	6	6	6	6
STRUCTURAL								
Reservoirs	1				1	1	1	1,2
Levees and/or floodwalls	1				1	1	1	1
Ice retention measure	4				1	1	1	2
Channel improvement	1	3	3	3	1	1	1	1,3
Diversion channel	2	3	3	3	1,3	1,3	1,3	
NONSTRUCTURAL								
Flood warning and emergency protection	4	4	4	4	4	4	4	4
Floodproofing	4				1,5	1,5	1,5	
Flood insurance and flood-plain management								
Permanent evacuation	1,3	1,3	1,3	1,3	1	1	1	1,3

Numbers in table refer to reasons for rejection listed below. More than one reason might apply, although only a single number might be shown.

1: Uneconomical
2: Engineeringly impracticable
3: Socially unacceptable
4: Incapable of providing adequate solution
5: No major need
6: Other (see text)

TABLE 8

COMBINATIONS OF MEASURES CONSIDERED FURTHER

DAMAGE AREA(S)*	COMBINATION OF MEASURES
Reach 1 - Cazenovia Creek	Floodproofing plus flood insurance and floodplain management. Levees and/or floodwalls plus flood insurance and floodplain management.
Reach 2 - Cazenovia Creek	Floodproofing plus flood insurance and floodplain management. Levees and/or floodwalls plus channel improvement plus flood insurance and floodplain management.
Reach 3 - Cazenovia Creek	Floodproofing plus flood insurance and floodplain management. Levees and floodwalls for Subreach 3B plus flood insurance and floodwalls for Subreaches 3B and 3C plus flood insurance and floodplain management. Levees and floodwalls for Subreaches 3A, 3B, and 3C plus channel improvement plus flood insurance and floodplain management.
Reaches 1, 2, & 3 - Cazenovia Creek	Reservoir near mile 11.7 plus flood insurance and floodplain management. Reservoir near mile 12.9 plus flood insurance and floodplain management. Ice retention structure plus flood insurance and floodplain management.
Tannery Brook	Floodproofing plus flood insurance and floodplain management. Diversion channel plus flood insurance and floodplain management.
Lower reaches of Buffalo River Basin	System of reservoirs on Cayuga, Buffalo and Cazenovia Creeks

* Refer to Plate 2

at nonsubsidized acturial rates. Floodplain management would control future floodplain developments by means of zoning laws, building codes, and subdivision regulations to prevent developments that might be incompatible with occasional flooding.

By definition, the floodplain of a river or creek is that area occupied by flowing or standing water during periods of flooding. For purposes of the National Flood Insurance Program, that portion of the floodplain carrying flow during the 100-year flood is called the floodway; that portion of the floodplain covered only by standing water during the 100-year flood event is called the floodway fringe. Floodplain management regulations are intended to keep developments out of the floodway not only to prevent damages to the development itself, but also to prevent flow obstructions which might raise stages and worsen flooding upstream. Developments can be allowed in floodway fringe areas, but floodproofing should be incorporated in their designs. Examples of appropriate floodplain developments under a floodplain management program include parks and recreational areas, nature study areas, parking facilities, agricultural uses, storage areas for materials not susceptible to water damage, and floodproofed facilities for developments requiring waterfront locations.

Many floodplain areas along Cazenovia Creek are presently free of flood-damageable developments and could be kept so by effective floodplain management. However, many other floodplain areas, particularly in the lower basin and along Tannery Brook are already occupied by floodprone developments. In some places, the developments extend to the edges of the channel banks. Perpetuation of such undesirable development could be prevented by floodplain management regulations permitting local Governments to acquire such floodplain lands for flood-compatible purposes as existing developments become obsolete, or requiring that replacement developments be floodproofed.

Floodproofing consists of modifications to structures to reduce flood damages. These modifications can be undertaken in existing buildings or incorporated into new buildings at locations where new development has been determined to be a proper use of the floodplain. Usually floodproofing measures are considered for properties which:

a. require waterfront locations to serve their intended function;

b. must be floodproofed to qualify for flood insurance;

c. cannot be protected adequately by other flood management measures; or for which

d. construction of flood management structures would not be economically feasible or would cause overriding adverse impacts.

There are many types of floodproofing measures which can be implemented depending on the circumstances encountered and the degree of protection desired. Floodproofing measures include those such as:

a. a backflow check valve in the main sewer line leading into a structure to prevent water from entering the building through underground sewer pipes;

b. watertight fittings in openings such as basement windows, a small levee, or filled low areas around a structure to prevent water from entering the building at grade level; and

c. construction of new structures or raising of existing structures above flood level.

Reach 1 of Cazenovia Creek extends from the confluence of the creek with the Buffalo River to Cazenovia Park (see Plate 2). The City of Buffalo is involved in a program of clearing channel banks and constructing slope walls to stabilize them. The city plans to extend these slope walls to the Buffalo River. The levee and floodwall measure considered for Subreach 1A (below Cazenovia Street) includes the construction of parapet walls along the creek and headwalls and flap valves on all storm sewer outlets into the creek. In Subreach 1B (upstream of Cazenovia Street in Cazenovia Park), the levee adjacent to the creek has been breached by the City of Buffalo and is partially removed. The entire length of this subreach provides area for ice storage. A new levee has been constructed by the city from Cazenovia Street to Green Road. Construction of another levee to extend from upstream of Green Street to near the intersection of Onondaga Avenue and Potters Road has been considered by the city.

In this study consideration was given to provide flood protection in Reach 1A. In the analysis of flood protection for 100- and 200-year floods the B/C ratios were 0.70 and 0.71, respectively. Flood protection measures considered consisted of providing a flood barrier (levee and/or flood walls) throughout the reach. Consideration of flood barrier protection above the 200-year level is not appropriate for Reach 1A as larger flows would be out of banks in upstream reaches and thus flow behind the considered Reach 1A flood barrier. A continuous system of flood barrier throughout the major flood prone reaches (1A through 3C) is not incremently justified as stated in subsequent paragraphs, and thus no further consideration of local flood protection was given to Reach 1A. Flooding associated with a SPF can only be managed on a system basis for the entire Buffalo River Basin. Further, it is not possible to provide SPF protection in Reach 1A separately because of its downstream location and susceptability to flooding from the remainder of the Buffalo River Basin.

The levee and/or floodwall measure considered for Reach 2 (see Plate 2) included some channel improvements. The channel between the New York State Thruway and Orchard Park Road would be widened to 300 feet. Both banks of the channel would be lined with riprap for 200 feet downstream of the Orchard Park Road Bridge to protect the banks from erosion by high velocity flows and eddies which the bridge construction could cause. A levee would be constructed along the left bank in this reach. The construction of a concrete cap on the existing pile wall and a new section of sheet pile wall would be necessary to insure that the works are tied to the New York State Thruway Bridge abutment. Upstream from Orchard Park Road to the Penn Central Transportation Company bridge, a levee would be constructed along the left side back from the creek bank.

For Reach 3, three levee and/or floodwall configurations have been considered:

a. an earth levee and floodwall system to protect the residential area and Southgate Shopping Plaza downstream of Union Road (designated Alignment A in the following discussion for brevity);

b. levees and floodwalls to protect the residential area and Southgate Shopping Plaza downstream of Union Road and the residential area upstream of Union Road to Mill Road (designated Alignment B); and

c. a levee and floodwall system covering the same developed areas as (b) above, but extending the earth levee downstream of Union Road to protect the open area along the right bank between Parkside Drive and Ridge Road (designated Alignment C).

Each of these configurations is described briefly in the following paragraphs:

a. Allignment A - Levee and floodwall Alignment A (reference to Plate 2 will aid the reader) would consist of a levee starting at the high ground near Seneca Street, following the rear property line of residences on the downstream (west) side of Parkside Drive to the creek bank, turning upstream (east) and paralleling the creek bank to high ground at the Southgate Shopping Plaza. From the upstream end of the levee a 3-foot high floodwall consisting of a sheet pile I-wall section would be constructed to Union Road. The creek channel along West Willowdale Drive near Parkside Drive would have to be relocated to provide sufficient room to construct the levee. Riprap bank protection would be provided as required along this section.

b. Alignment B - Levee and floodwall Alignment B would be identical to Alignment A downstream of Union Road. Upstream of Union Road a levee would be constructed along the right bank, continuing upstream of Mill Road to meet Seneca Street. Riprap bank protection would be provided as required along this section.

c. Alignment C - The undeveloped land downstream of Union Road between Parkside Drive, Seneca Street, and Cazenovia Creek is presently zoned for commercial use. Consideration was given to changing Alignment B to enclose the entire right bank floodplain between the Union Road Bridge and the Ridge Road Bridge. This would be done by deleting the levee paralleling Parkside Drive and extending the levee along the creek bank to high ground adjacent to the Ridge Road Bridge. Since this alignment would encroach into the floodway, there would be a sizable loss of ice storage and flow area, which would be compensated for by enlarging the channel between the Ridge Road and Union Road Bridges. The channel would be excavated to a trapezoidal shape with a bottom width of 150 feet and 1 vertical on 2-1/2 horizontal side slopes.

A reservoir located just upstream of a major damage center offers the greatest degree of protection against flood damage, since it can control high discharges resulting from excessive runoff. With a reservoir, the discharge down Cazenovia Creek could be controlled thereby avoiding both free flow and ice-related flooding problems. In addition, a reservoir would provide some flow regulation, a reduction in sediment deposition downstream, and possible improvement in the aesthetic and fishing conditions of the creek. Two reservoir sites, both providing an equal degree of protection were considered. These sites, shown on Plate 1, are located about a mile apart near Spring Brook, NY.

As previously stated flood barriers or levees would not provide suitable flood protection against a Standard Project Flood and they are not cost effective either as a total system or incremently. Therefore a system of reservoirs located strategically in the Buffalo River Basin is the only reasonable solution to provide flood protection against the SPF. The system considered was a combination of reservoirs. The end result of the considered system was that the most effective system would be one reservoir on each of the creeks. Site selection for the three reservoirs was based upon providing control of the maximum drainage area at locations that would be the most acceptable environmentally, socially and economically. In addition to flood control, the reservoirs would provide some low-flow regulation capability and reduce sediment deposition downstream. Site II at Spring Brook was considered for Cazenovia Creek, a site near Cowlesville for Cayuga Creek and near Wales Center for Buffalo Creek. The Spring Brook dam would have characteristics similar to those shown in Table D-4 of Appendix D except that the dam dimensions would be modified to provide reservoir storage for runoff associated with a SPF. The Cowlesville dam and Wales Center dam would also be sized to provide storage of runoff associated with a SPF. The Cowlesville dam would be earthfill with a gated conduit and the Wales Center dam would be earthfill, have a concrete spillway, and outlet conduits.

The levee and/or floodwall measure considered for Reaches 1, 2, and 3 discussed in the preceeding paragraphs give protection individually to each of the reaches against high water levels whether the high water levels are caused by ice jams or free flow conditions. An alternative approach is to attack the major source of flood problems, namely, ice jamming, rather than defending against its symptoms, high stages from temporary damming. Throughout the major damage areas, the ice-free stage for a given flow is significantly less than the ice-affected stage. Therefore, consideration was given to constructing a dam-like structure across the creek at some point just upstream of the ice problem areas for the purpose of creating a pond to allow a stable ice cover to form and hold back ice coming downstream during periods of ice breakup.

Careful consideration was given to site selection for an ice retention structure. Two of the most important are: proximity to damage area, and topographic features that would allow storage of ice. The selected site meets both of these important criteria and the land is unoccupied and in an area that is unsuitable for development. The project area is in a gorge.

An ice retention structure located approximately 5,000 feet upstream of Union Road as shown on Plate 9, could be expected to provide complete protection to Reach 3 against ice jamming. However, since ice would continue to form along the creek downstream of the dam, the effectiveness of an ice retention structure would decrease with increasing distance downstream. Therefore, Reaches 1 and 2 might not be provided with complete protection against ice jamming.

As shown on Plate 9, the structure would consist of a low concrete dam which would pond water, thereby permitting formation of a stable ice cover upstream of the dam during the winter. During ice breakup periods, ice floes from upstream would be trapped by the ice cover and would be prevented from being carried downstream to reaches which have experienced ice jamming in the past. An ice boom would be installed just upstream of the dam to further insure that ice would not move downstream during periods of high flow. The dam would be provided with three 36-inch diameter gated conduits to permit the pool to be drained for the summer and fall or for sediment removal, maintenance, and installation and removal of the ice boom. Additional minor improvements, including making manholes in Reach 3 watertight, would have to be incorporated to derive all potential benefits.

Consideration was given to combining the ice retention structure with other major improvements such as levees or floodproofing in Reaches 1, and/or 2, and/or 3. Since stages would be reduced under ice-free conditions, the costs of these additional measures would be correspondingly lower than those for ice-affected conditions. However, as shown in Table 4, with the exception of Subreach 1A, the ice retention structure reduces downstream flood damages to the extent that, on an incremental basis, additional protective measures would not be economically justifiable. Stages in Subreach 1A are not affected by the ice retention structure. Therefore, improvements in this subreach would be essentially identical to those considered independently of the ice retention structure. Minor measures, such as channel excavation, low levees and floodproofing were investigated in combination with the ice-retention structure but were not cost-effective. Very little damage is caused by free flow conditions and residual average annual damages are insufficient to support or justify even a minimal construction cost. There would be no flood damage reduction benefits attributable to the ice-retention structure during ice-free conditions. The structure is designed and effective for ice only and not free flow conditions.

The diversion measure considered for the Tannery Brook subbasin would protect aginast the 200-year flood event. Low flows up to 25 cfs would be permitted to pass down the existing channel. When flows greater than this occurred, part of the flow would be diverted into the Buffalo Creek watershed. For example, with a 100-year flow of 1100 cfs, approximately 775 cfs would pass into the diversion channel and 325 cfs would flow down Tannery Brook. A levee would dam the existing creek and extend along the left bank of the diversion channel to protect low areas immediately downstream of the project. Culverts would carry low flow under the levee to the natural stream and a low-stage weir in the new channel would regulate high flows. A culvert enlargement would be required in order to pass the diverted flows under Porterville Road in the Buffalo Creek watershed. A culvert would have to be installed to carry the diverted flows under the Aurora Expressway. A diversion channel to divert all or part of a SPF flow is engineeringly impracticable and creates unnatural flooding problems in the adjoining watershed.

Step 4 in the plan selection and formulation process consists of analyzing identified measures and combinations of measures to determine which satisfy the economic criterion that tangible benefits must exceed economic costs. In other words, economically feasible or viable measures and combinations of measures are those with benefit/cost ratios greater than one.

The preliminary cost evaluations for the structural (including floodproofing) features of the combinations of measures shown in Table

8 were based on October 1973 price levels. Where appropriate, unit costs presented in the Cazenovia Creek Phase I report were updated from the August 1972 level to the October 1973 level by multiplying the unit costs by a factor reflecting the average increase on construction costs presented in the Engineering News Record.

Annual charges were based on an interest rate of 5-5/8 percent and an assumed economic life of 100 years. Engineering and design and supervision and administration costs were not included in costing lands and damages. The annual maintenance cost for each of the structural features was assumed to equal 1 percent of the first costs for that feature. With the exception of the reservoirs, all improvements could be constructed within one year, permitting interest costs during construction to be disregarded. The construction period for the reservoirs was estimated to be two years. Therefore, interest expenses during construction were added to the construction cost to derive the total economic investment.

Levee and floodproofing costs were based on designs providing a 100-year degree of protection, the minimum, desirable for local protection measures in urban areas as specified in the technical criteria. The reservoirs considered would provide protection exceeding the 200-year level for all downstream reaches. The degree of protection down-stream of the ice retention measure would vary as shown in Table 4 under ice-free conditions. The diversion channel costed for Tannery Brook would protect against a 200-year flood event, which would be more than adequate to handle the 1955 maximum flood of record.

Normally, floodproofing costs would be the responsibility of individual homeowners. However, in accordance with Section 73 of P.L. 93-251, which limits the non-Federal share of nonstructural improvements to 20 percent, the cost apportionment for floodproofing was assumed to be on an 80-percent Federal/20 percent non-Federal basis. The cost allocation for structural measures was assumed to follow the local cooperation requirements specified under Section 3 of the Act of 27 June 1936 (P.L. 74-738), as amended by subsequent directives. In general, non-Federal interests are responsible for securing lands, easements, and rights-of-way; relocations or alterations of roads, bridges, and utilities; and operation and maintenance of the project.

The average annual benefits for any given flood control improvement are equal to the reduction in average annual damages that can be attributed to the improvement. The estimate of existing average annual damages is generally based on an analysis of stage-damage, stage-discharge, and discharge-frequency relationships under existing conditions for the damage area under consideration. These relationships for that portion of Cazenovia Creek from near Mill Road in the Town of West Seneca to the mouth of the creek are represented by curves presented in Plates 3, 4, and 5. Flood control improvements change these relationships. For instance, a levee would affect the stage-damage relationship by preventing all damages below certain elevations. These changes are reflected in reduced average annual damages. The difference between the existing and modified average annual damage figures represents the tangible average annual benefits from the particular improvement. Damage-frequency relationships for the above-mentioned portion of Cazenovia Creek are represented by curves in Plate 6. The damage-recurrence relationship for the same portion are represented by curves presented in Plate 7.

Table 9 shows the results of analyses of average annual flood damages under existing conditions and both average annual flood damages and benefits given 100- and 200-year degrees of protection. These figures for 100-year protection apply to the levee and/or floodwall improvements considered. Floodproofing to a 100-year level would not provide the full amount of benefits shown since street and yard damage, post-flood clean-up, business disruptions, etc. would not be prevented. The reservoirs were assumed to provide total flood protection for the lower basin and, by acting as a sediment trap, to reduce the quantity of dredging required in Buffalo harbor. Benefits for the ice retention structure were derived from a comparison of annual flood damages for ice-affected and ice-free conditions as shown in Table 4. The Tannery Brook diversion channel was assumed to provide complete protection for East Aurora developments.

Table 9A presents cost and benefit data for a system of three reservoirs to provide SPF protection in the Buffalo River Basin. Costs are based on October 1974 price levels and a two year construction period. Interest at 5-7/8 percent during construction for one-half the construction period, is included in the investment cost. Annual cost is based upon the investment cost. A 100-year economic life and 5-7/8 percent interest rate were assumed and the annual cost includes $383,000 for operation, maintenance and replacement associated with the three dams.

Table 10 presents a summary of pertinent cost and benefit data for the "structural" features of the combinations of measures analyzed economically. The results indicate that only three alternative plans are economically feasible -- floodproofing in Reach 3 plus flood insurance and floodplain management, with a benefit/cost ratio of 1.39; levees and floodwalls along Alignment A in Reach 3 plus flood insurance and floodplain management, with a benefit/cost ratio of 1.02 (which becomes 0.98 with October 1974 prices and an interest rate of 5-7/8 percent); and the ice retention structure plus flood insurance and floodplain management, with a benefit/cost ratio of 2.06.

TABLE 9

AVERAGE ANNUAL DAMAGES AND BENEFITS FOR CAZENOVIA CREEK BASIN, NEW YORK UNDER EXISTING CONDITIONS AND WITH 100- AND 200-YEAR DEGREES OF PROTECTION(1)

DAMAGE AREA	EXISTING AVG. ANNUAL DAMAGES, $/YR	RESIDUAL AVERAGE ANNUAL DAMAGES, 4/YR		AVERAGE ANNUAL BENEFITS, $/YR	
		100-YR PROTECTION	200-YR PROTECTION	100-YR PROTECTION	200-YR PROTECTION
Subreach 1A	66,400	40,400	29,500	26,000	36,900
Subreach 1B	9,500	3,500	1,900	6,000	7,600
Subreach 2A	12,400	1,600	800	10,800	11,600
Subreach 2B	1,700	200	100	1,500	1,600
Subreach 3A	100	60	40	40	60
Subreach 3B	96,100	6,300	3,200	89,800	92,900
Subreach 3C	9,300	2,600	1,300	6,700	8,000
Total for Cazenovia Creek	195,500	54,660	36,840	140,840	158,660
Tannery Brook	16,000	(2)	0	(2)	16,000

(1) October 1973 price levels; mid-1972 degree of development.
(2) Not available.

Total average annual damages shown in Table 9 for Tannery Brook are $16,000 and the total average annual cost shown in Table 10 is $34,000. Interest and amortization applied to costs for lands, damages and relocations amount to $24,000, and $10,000, the remainder of the total annual charges, is cost associated with channels, levees, structures and O&M. For any degree of protection considered for Tannery Brook, the annual cost of $24,000 associated with lands, damages and relocations would remain about the same since the extent of work would be comparable. The total average annual benefit that would result from a 200-year flood amounting to $16,000 is insufficient to justify even the nonvariable cost of $24,000. It is apparent from the stage frequency curves shown on Plate 19 and the stage-damage and damage-frequency curves shown on Plate 24 of the Technical Appendix that flood protection greater or less than the 200-year event could not be economically justified since the total annual damage would remain about constant.

TABLE 9A

COST AND BENEFIT DATA FOR BUFFALO RIVER BASIN, NY

UNDER EXISTING CONDITIONS AND WITH SPF PROTECTION

Item	System of 3 Reservoirs on Cayuga, Buffalo and Cazenovia Creeks
Total First Cost	$ 90,000,000
Interest During Construction	5,288,000
Total Investment	95,288,000
Annual Cost	
Interest and Amortization	5,617,000
Operation, Maintenance, Replacement	383,000
Total Average Annual Cost	6,000,000
Total Damage (SPF)	1,000,000,000
Average Annual Damage	3,750,000
Benefit/Cost Ratio	0.63
Degree of Protection	SPF

TABLE 10

ECONOMIC FEASIBILITY MATRIX(4)

ITEM	DIVERSION Channel TANNERY BROOK	RESERVOIRS		LEVEES AND FLOODWALLS					FLOODPROOFING				ICE RETENTION STRUCTURE
		Site I (Upstream)	Site II (Downstream)	Reach 1	Reach 2	Reach 3 Alignment A	Reach 3 Alignment B	Reach 3 Alignment C	Reach 1	Reach 2	Reach 3	Tannery Brook	
	$	$	$	$	$	$	$	$	$	$	$	$	$
[illegible] Cost	571,000	28,565,000	26,590,000	1,416,000	634,000	1,377,000	2,745,000	4,766,000	2,866,000	226,000	1,001,000	393,000	1,037,000
Federal	484,000	26,725,000	24,980,000	976,000	569,000	1,169,000	2,280,000	3,916,000	2,293,000	181,000	801,000	314,000	819,000
Non-Federal	87,000	1,840,000	1,610,000	440,000	65,000	208,000	465,000	850,000	573,000	45,000	200,000	79,000	21[illegible]
[illegible] Average Annual [illegible], Amortization [illegible] Cost	5,200	135,400	125,000	14,200	6,300	13,800	27,500	47,700	28,600	2,300	10,000	3,900	10,[illegible]
Federal	[illegible]	0	0	400	200	500	500	500	1,000	200	500	400	[illegible]
Non-Federal	4,800	135,400	125,000	13,800	6,100	13,300	27,000	47,200	27,600	2,100	9,500	3,500	9,[illegible]
[illegible] Average Annual Cost	34,000	1,728,900	1,678,000	94,200	42,100	91,600	182,600	317,100	190,500	15,000	66,500	26,800	65,[illegible]
Federal	24,500	1,503,000	1,461,000	55,500	32,300	66,500	128,200	221,900	130,500	10,400	45,700	18,900	4[illegible],700
Non-Federal	9,500	225,900	217,000	38,700	9,800	25,100	54,400	95,200	60,000	4,600	20,800	7,900	21,[illegible]
[illegible] Annual [illegible]	[illegible]	341,400(1,3)	341,400	47,900(2)	12,300	93,200(6)	96,500(6)	124,500(2,6)	28,200(5)	9,800(5)	92,200(5)	14,[illegible](5)	111,[illegible](1)
[illegible] Annual [illegible]	-18,[illegible]	-1,387,500	-1,2[illegible]	-46,300	-29,800	1,600	-86,100	-192,600	-162,300	-5,200	25,700	-12,[illegible]	[illegible]
[illegible] Ratio	0.47	0.20	0.21	0.51	0.29	1.02(9)	0.53	0.39	0.15	0.65	1.39	0.5[illegible]	1.[illegible]
Degree of Protection [illegible]	200	(7)	(7)	100	100	100	100	100	100	100	100	100	[illegible]

(1) [illegible] $[illegible] in annual benefits in Subreach 1A for discontinuation of ice patrols.

(2) [illegible] $[illegible] for annual and enhancement benefits to presently undeveloped areas.

(3) Includes $120,[illegible] for annual sediment benefits.

(4) [illegible] 1973 price levels; mid-1973 degree of development.

(5) [illegible] benefits are adjusted for items which are not prevented by floodproofing, including yard damage and costs of flood emergency operations and post-flood cleanup.

(6) Includes $[illegible] in average annual benefits for Subreach 3B.

(7) Provides protection in excess of 200-year level to all downstream reaches; assumed total protection

(8) [illegible] of protection provided to downstream reaches varies. Table 4 shows degree of protection under free flow conditions.

(9) [illegible] ratio becomes 0.96 based on October 1974 prices and an interest rate of 5-7/8 percent.

SELECTING AND ANALYZING ALTERNATIVES PLANS

Step 5 in the plan selection and formulation process is to develop alternative plans for the basin, each plan consisting of compatible measures and/or combinations of measures that have passed the economic feasibility test and would provide a coordinated basinwide flood management program. Given mid-1972 development in the Cazenovia Creek basin and October 1973 prices, there are only three economically viable alternative plans -- floodproofing in Reach 3 plus flood insurance and floodplain management, levee and floodwall protection along Alignment A in Reach 3 plus flood insurance and floodplain management, and an ice retention structure plus flood insurance and floodplain management. Because these alternative plans provide protection to essentially the same area, they cannot be incorporated into one plan. The result is three independent alternatives for basinwide flood control:

a. floodproofing in Reach 3 plus flood insurance and floodplain management for the entire basin;

b. levee and floodwall protection along Alignment A in Reach 3 plus flood insurance and floodplain management for the entire basin, (this alternative becomes nonviable given October 1974 prices and an interest rate of 5-7/8 percent); and an

c. ice retention structure plus flood insurance and floodplain management for the entire basin.

The following discussion covers Step 6 of the plan selection and formulation process, that is, analysis of these alternative plans on the basis of specific national economic development (NED), environmental quality (EQ), social well-being (SWB), and regional development (RD), factors to permit the planner to compare and weigh the relative merits and deficiencies of the alternatives and selecting the plan best suited to solving problems and satisfying needs of the study area. After the best plan is selected, Step 7 in the process requires that the plan's optimum scale of development be determined in order to maximize economic return.

Selection of a NED and a EQ plan from data discussed in this section of the report and displayed in Table 10 becomes a matter of considering floodproofing in Reach 3 or construction of an ice retention structure. Flood insurance and floodplain management are measures common to the floodproofing alternative in Reach 3 and the ice retention structure alternative. Only these two alternatives have a benefit/cost ratio greater than 1.0 on current price levels and interest rates.

Construction and cost sharing for floodproofing are more difficult to determine and assess than the construction of an ice retention structure. The method to implement floodproofing on a specified schedule and maintaining the work is far more complex than constructing an ice retention structure. Each home or commercial building requires individual types of floodproofing. Floodproofing does not reduce flooding and evidence of flooding would remain after the flood waters receded. Landscape damage, highwater marks on buildings and scars on trees would be evidence of the flood. During a flood, access to and from homes and businesses would be difficult and in some instances jeopardize the health and safety of people. Emergencies such as fires, acute health problems such as heart, kidney, diabetes, and accidents could occur coincident with flooding and emergency vehicles could have difficulty responding.

Some of the environmental impact of floodproofing would be visible. Many homes would have tarred walls, glass blocks or no windows in the basement, flood shields on doors and openings, and be built at an unusually high elevation. A noticeable lack of fine shrubs and landscaping would be apparent.

With floodproofing there is always the possibility of structural failure. A home or building altered to prevent water from entering could collapse from the hydrostatic pressure if the walls are not reinforced to withstand the increased pressure.

Exchange of floodproofed properties could become difficult causing property owners to reduce their selling price. Prospective buyers noticing signs of past flooding and floodproofing, could use this evidence as a means of demanding a reduction in purchase price or refuse to buy.

An ice retention structure would reduce overbank flooding caused by ice jams and floodproofing would not. The proposed ice retention structure would only be visible to people walking along Cazenovia Creek and those who wish to view the structure from the high banks along the gorge. The greatest apparent change to most people, familiar with the area, would be the reduction of ice jams and overbank flooding in Reaches 1, 2, and 3 of lower Cazenovia Creek. As with any structure young people are apt to play on and around the unoccupied structure. Should an injury occur a person could remain unnoticed unless the area was under regular surveillance.

Damage to the natural environment resulting from constructing an ice retention structure is greater than with floodproofing. However environmental damage would be temporary during construction and restoration wherever possible would be accomplished upon completion of the structure.

Costs associated with floodproofing in Reach 3 and construction of an ice retention structure are about the same but average annual benefits resulting from construction of an ice retention structure are almost three times those for floodproofing.

The social well being of people living in the Reach 3 area is more adversely affected with floodproofing than with an ice retention structure. With an ice retention structure, overbank flooding would be greatly reduced thereby relieving people of worry from the many adverse impacts associated with the almost annual overbank flooding and ice strewn on the lawns and properties in Reach 3.

Based on the data presented in previous paragraphs and on public reaction, by people who experience overbank flooding along lower Cazenovia Creek, to alternative plans investigated, the proposed ice retention structure is selected to be both the NED and the EQ plan.

Table 11 is a matrix showing quantitative and qualitative assessments of the impacts of the three alternative plans on NED, EQ, SWB, and RD factors. The baseline condition for EQ, SWB, and RD assessments is the present degree of development in the study area. The NED portion of the matrix is derived from Table 10 for the mid-1972 level of development and is based on October 1973 price levels.

From a NED standpoint, the ice retention structure is clearly preferable because it provides the greatest economic return as reflected by its higher net benefits figure. The ice retention structure not only provides better protection to Reach 3 developments, it also extends its protection to downstream areas. Floodproofing protects the structures in Reach 3 against the 100-year flood, but does not prevent flooding of streets and yards and other major flood-related expenses. The levee and floodwall alternative provides a 100-year degree of protection for Subreach 3B and Subreach 3C downstream of Union Road, but at a much higher cost than the ice retention structure. Furthermore, this alternative becomes nonviable given October 1974 prices and an interest rate of 5-7/8 percent.

As shown by the matrix, the floodproofing alternative would cause no significant EQ problems. The levee and floodwall alternative would involve the conversion of a few acres of natural terrestrial and aquatic habitat to revegetated levee slopes and "improved" channel. The ice retention structure would result in the conversion of approximately 6 acres of natural terrestrial habitat to damsite and a part of a ponding reservoir. During late winter and early spring, six acres of the creek's channel would also serve as part of the ponding reservoir. Although the floodproofing alternative might involve the least environmental impact, the small amount of environmental degradation with the ice retention structure could be largely offset by preserving the aesthetic values in the semi-natural setting of the pool as a park or developing this area for recreational uses.

TABLE 11

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basinwide Floodplain Management and Flood Insurance
	$	$	$
NATIONAL ECONOMIC DEVELOPMENT			
Total First Costs	1,377,000	1,001,000	1,037,000
Federal	1,169,000	801,000	818,000
Non-Federal	208,000	200,000	219,000
Total Annual Operation, Maint. and Replacement Costs	13,800	10,000	10,000
Federal	500	500	500
Non-Federal	13,300	9,500	9,500
Total Average Annual Cost	91,600	66,500	68,600
Federal	66,500	45,700	46,700
Non-Federal	25,100	20,800	21,900
Total Ave. Annual Benefits	93,200	92,200	141,300
Net Average Annual Benefits	1,600	25,700	72,700
Benefit/Cost Ratio	1.02*	1.39	2.06

* Given October 1974 prices and an interest rate of 5-7/8 percent. This ratio becomes 0.98.

TABLE 11 (cont'd)

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS
CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basin-wide Floodplain Management and Flood Insurance
ENVIRONMENTAL QUALITY			
Woody Scrubland Gained or Lost (± acres)	-1	0	-15
Wetlands Gained or Lost (± acres)	0	0	0
Natural Channel Bottom Gained or Lost (± acres)	-2	0	0
Improved Channel Bottom Gained or Lost (± acres)	+2	0	0
Unvegetated Terrestrial Areas (roads, foundations) Gained or Lost (± acres)	0	0	+1/2
Revegetated Area Gained or Lost (± acres)	+4	0	+9-1/2
Cultivated Land Gained or Lost (± acres)	-3	0	0
Pool Environment Gained or Lost (± acres)	0	0	+5

TABLE 11 (cont'd)

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS
CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basinwide Floodplain Management and Flood Insurance
ENVIRONMENTAL QUALITY (Cont'd)			
Effect on Stream Quality	Temporarily Slightly Negative	None	Slightly Negative
Effect on Air Quality	Temporarily Slightly Negative	None	Temporarily Slightly Negative
Effect on Local Wildlife Breeding Habitat	None	None	Slightly Negative
Rare, Endangered, or Unique Species Affected	None	None	None
Scenic, Recreation, or Wilderness Areas Affected	None	None	Recreational Benefit, Could be Utilized in a Park System
Historical and/or Archeological Sites Affected	To be Determined	None	To be Determined
Effect on Stream Erosion	None	None	Ice Scour Patterns Shifted. Possible Slight Increase in Erosion Near Stilling Basin

TABLE 11 (cont'd)

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS
CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basinwide Floodplain Management and Flood Insurance
ENVIRONMENTAL QUALITY (Cont'd)			
Mineral Resources Affected	None other than Materials Needed to Implement the Project	None other than Materials Consumed in Implementing the Project	None other than Materials Needed to Implement the Project
Effect on Area Water Table	None	None	Slight Local Elevations, Considered Negligible.
SOCIAL WELL-BEING			
Flood Protection			
Residences Protected	202	351	697
Businesses Protected	37	37	64
Farmlands Protected (acres)	0	0	0
Total Flood Damage Reduction (percent)	44	44	67
Effect on Downstream Flooding	None	None	Reduction
Relocations Required	None	None	One Abandoned Storage Shed
Bridge Modifications or Removal	None	None	None

TABLE 11 (cont'd)

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS
CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basinwide Floodplain Management and Flood Insurance
SOCIAL WELL-BEING (Cont'd)			
Roads Severed	None	None	None
Socially Important Sites Affected (e.g. cemeteries, churches)	None	None	None
Effect on Public Health and Safety	Highly Beneficial Due to Alleviating of Flood Threat	Negligible	Highly Beneficial Due to Alleviating of Flood Threat
Effect on Available Water Supply	None	None	None
Effect on Recreation Activities	Trailways Could be Incorporated into Levee Plan	None	Site of Structural Works Could be Developed as a Park

TABLE 11 (cont'd)

IMPACT MATRIX FOR ALTERNATIVE FLOOD MANAGEMENT PLANS
CAZENOVIA CREEK BASIN, NEW YORK

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	Levee and Floodwall along Alignment A in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Floodproofing in Reach 3 Plus Basinwide Floodplain Management and Flood Insurance	Ice Retention Measure Plus Basinwide Floodplain Management and Flood Insurance
REGIONAL DEVELOPMENT			
Loss in Area Tax Base	Negligible	None	Negligible
Effect on Community Development Patterns	Floodplain Management will Control Type and Extent of Future Floodplain Developments	Floodplain Management will Control Type and Extent of Future Floodplain Developments	Floodplain Management will Control Type and Extent of Future Floodplain Developments
Effect on Recreation Developments	Floodplain Management Could Encourage Development of Recreation Facilities Alongside Creek	Floodplain Management Could Encourage Development of Recreation Facilities Alongside Creek	Floodplain Management Could Encourage Development of Recreation Facilities Alongside Creek
Effect on Regional Economic Growth	Generally Positive	Generally Positive	Generally Positive

The impacts of the alternative plans on the SWB of the study area are related primarily to the reduction in flood damages. As stated before, the ice retention structure is superior to the other alternatives both in extent and degree of protection. Residents in Reach 3 have expressed opposition to floodproofing as a solution because it would not prevent disruption of public services and traffic, nor would it relieve the need for post-flood cleanup. Consequently, floodproofing would have to be considered a socially unacceptable solution to flooding in Reach 3. Psychologically, a levee and floodwall measure might be superior to floodproofing or the ice retention structure because of the visually obvious physical barrier against floodwaters. Actually, however, the levee and floodwall measure would be inferior to the ice retention structure in extent and degree of protection provided.

The major impacts on regional development would be caused by the floodplain management provisions of these alternative plans. The ice retention structure would lower flood stages in downstream reaches, resulting in a reduction in both the size of the 100-year floodplain and the stages within it. By reducing the area subject to floodplain management and flood insurance coverage and the stages within the floodplain, the ice retention structure could promote development that might not take place or that might be more costly under existing conditions. Conversely, floodproofing in Reach 3 would have no effect on stages or the extent of flooding. Therefore, only the floodplain management aspect of the floodproofing alternative plan would impact on regional development. A levee and floodwall measure along Alignment A in Reach 3 would provide a physical barrier against floodwaters for an area essentially already fully developed. Therefore, likely, only the floodplain management provision of this alternative plan would have much impact on regional development.

The Economic Feasibility Matrix and Impact Matrix display all necessary data to identify and select the best plan of Flood Management in the Cazenovia Creek basin. Some difficult trade-off decisions are usually inherent in the plan selection process but for the three action plans considered for Flood Management of Cazenovia Creek Basin, selection and trade-off decisions are relatively apparent and easy to make. Furthermore, a "no action" plan would not provide relief from tangible and intangible flood damage which are the planning goals to be achieved in flood management of the Cazenovia Creek Basin.

Alternative 3, displayed in the impact matrix, is the selected NED and EQ plan. This plan provides the greatest amount of flood protection and provides the greatest economic return. With expected rises in construction costs and interest rates, plan 3 is the only plan displayed that will have a reasonable excess of benefits over costs at expected time of construction. The selected plan would create an 11-acre pool that could serve as a focal point in development of a scenic wilderness area for recreation close to the highly urbanized area of the town of West Seneca. The natural beauty of lower Cazenovia Creek, in easy view of large numbers of people in the area, would remain unaltered. The ice retaining structure would be unnoticed by the majority of people because of its location in an isolated area that is difficult to view from the highway and because of rather dense natural growth of trees and brush. All of the planning goals, cited at the beginning of this Section, can be met and satisfied with construction of an ice retention structure. Several of the goals cannot be met by floodproofing and the environmental quality objective would be best satisfied with construction of an ice retention structure, since there would be no change in Cazenovia Creek that would be very easily viewed by people in the area. Levees and floodwalls would be very apparent and floodproofing would constantly be seen by home owners and the debris that would remain after a flood would also be unsightly. Also, the ice retention structure has no adverse impacts on protected properties like local protection measures would have.

Clearly, NED, SWB, and RD considerations indicate that the alternative plan providing for the ice retention structure is superior to the floodproofing and levee and floodwall alternatives. Although the ice retention structure has some detrimental EQ impacts, these are minor and could be largely offset by aesthetic treatments and possible recreational developments. Consequently, the selected plan for flood control in the Cazenovia Creek basin consists of the ice retention structure located about 5,000 feet upstream of Union Road plus basinwide flood insurance and floodplain management.

Formulation of the selected plan for economic optimization usually involves analyses of costs and benefits for various degrees of protection to determine the scale of development that maximizes net average annual benefits. The nonstructural feature of the selected plan for Cazenovia Creek -- flood insurance and floodplain management -- could not be formulated since it is established by legislation to apply to the area within the 100-year floodplain. However, the structural feature of the selected plan -- the ice retention structure -- was analyzed for economic optimization.

Two scales of development were examined:

a. The ice retention structure alone.

b. The ice retention structure augmented by other measures to increase the degree of protection provided to downstream reaches.

The ice retention structure, by trapping ice floes from the watershed above it, provides a 125-year level of protection in Subreach

3B where most of the damage occurs, and lesser degrees of protection in other subreaches as shown in Table 4. No other structural measure considered was as cost effective in providing protection of this or a lesser degree throughout the lower basin.

To increase the degree of protection, other measures must be added to protect against flooding caused by free flow. The only damage reach downstream of the ice retention structure where substantial average annual damages remain is Subreach 1A. Thus, consideration was given to adding floodwalls in this subreach to augment the protection provided to the lower basin by the ice retention structure. The degree of protection considered for Subreach 1A was 200-years. The results of the economic analysis are shown in Table 12.

It is evident from Table 12 that the economic optimum. i.e. the maximization of net benefits, occurs with the ice retention structure alone. Therefore, the recommended Cazenovia Creek flood control plan consists of an ice retention structure constructed approximately 5,000 feet upstream of Union Road and basinwide floodplain management and flood insurance through participation in the National Flood Insurance Program.

THE SELECTED PLAN

This section describes in detail the plan selected to meet water and related land resource needs in the Cazenovia Creek basin. Costs and benefits in this section have been updated to reflect October 1974 price levels and an interest rate of 5-7/8 percent. The description includes physical features, accomplishments, effects of the plan, and significant design and construction information. The recommended measures for the basin including those for the Tannery Brook subbasin are shown on Plate 11. The degree of protection provided by the structural feature of the selected plan to Reaches 1, 2, and 3 in the lower portion of the Cazenovia Creek basin varies in accordance with the free flow return period shown in Table C-5. The selected plan provides benefits of $153,400, with remaining average annual damages of only $4,000, exclusive of those in Subreach 1A and along Tannery Brook.

PLAN DESCRIPTION

The selected plan for the Cazenovia Creek basin is described in Table 13. Participation in the National Flood Insurance Program is the suggested nonstructural feature of the selected plan. The U.S. Department of Housing and Urban Development (H.U.D.), the administering agency for this program, has issued preliminary maps showing flood hazard areas for every township in the Cazenovia Creek basin plus the City of Buffalo

TABLE 12

ECONOMIC OPTIMIZATION OF THE STRUCTURAL PORTION OF THE SELECTED PLAN(1)

TYPE OF PROTECTION	AVERAGE ANNUAL BENEFITS $/YEAR	AVERAGE ANNUAL COSTS $/YEAR	NET AVERAGE ANNUAL BENEFITS $/YEAR	B/C RATIO
Ice Retention Structure Alone	$141,300	$ 68,600	$ 72,700	2.06
Ice Retention Structure Plus Floodwalls in Subreach 1A	178,200(3)	120,600(2)	57,600	1.48
Incremental Costs-Benefits	36,900	52,000		0.71(4)(5)

(1) This table is based on October 1973 price levels and mid-1972 level of development.

(2) Based on estimated first costs of $782,000 for floodwalls, a closure structure at Cazenovia Street, and internal drainage improvements in Subreach 1A. Annual maintenance is estimated at 1 percent of first cost.

(3) $141,300 from the ice retention structure; $36,900 for 200-year protection in Subreach 1A (see Table 9).

(4) Average annual costs and benefits for 100-year protection is $37,200 and $26,000 respectively for a BCR of 0.70.

(5) Approximately 30 percent of the damages in Subreach 1A are to residential contents. When the affluence factor is applied to the contents, the average annual incremental benefits for 200-year protection becomes $44,100 and the resultant B/C ratio is 0.85.

TABLE 13

SELECTED PLAN FOR CAZENOVIA CREEK BASIN, NEW YORK

DAMAGE AREA	PLAN OF ACTION
Reach 1 - Buffalo River to N. Y. State Thruway	Ice retention structure will provide some benefits by reducing ice-affected flood stages. Floodplain management and flood insurance are advisable.
Reach 2 - New York State Thruway to Ridge Road Bridge	Ice retention structure will reduce the ice-affected flood stages in Reach 2 providing some benefits. Floodplain management and flood insurance are advisable.
Reach 3 - Ridge Road Bridge to upstream of Mill Road	Ice retention structure will provide substantial benefits in Reach 3 by reducing the ice-affected flood stages. Floodplain management and flood insurance are advisable.
Main stem of Cazenovia Creek between ice retaining measure and confluence of East and West Branches	Floodplain management and flood insurance are advisable.
West Branch	Floodplain management and flood insurance are advisable.
East Branch	Floodplain management and flood insurance are advisable.
Tannery Brook	No structural measure was found to be economically feasible along Tannery Brook. Floodplain management and flood insurance are advisable. Individual homeowners may find it desirable to floodproof their residences.

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and the Village of East Aurora, indicating the overall basinwide need for effective floodplain management for all areas bordering the creek and its major tributary, Tannery Brook.

The structural flood protection measure recommended for the Cazenovia Creek basin is an ice retention structure to be constructed approximately 1 mile upstream of Union Road (see Plate 9). The structure would consist of a low concrete dam to form an 11-acre stilling pool with a maximum depth of approximately 10 feet, and an ice retaining boom to float on the pool (see Plate 10). The pool would serve to still water flowing into it and thereby promote formation of sufficient ice cover during the winter to prevent ice floes from moving downstream into Reaches 1, 2, and 3 during ice breakup periods. The boom would serve to obstruct ice floes during periods of thaw and/or high flow. The dam would be equipped with three 36-inch diameter conduits. The culverts would be able to pass about 95 percent of normal summertime flows with no major ponding of water. With the gates open, an occasional runoff event would cause ponding to depths in excess of 6 feet, but only for a few hours. Local interests might prefer to maintain a permanent pool on a year-round basis except for drawdowns for maintenance, installation and removal of the ice boom, etc.

EFFECTS OF THE SELECTED PLAN

Based on the mid-1972 level of development and October 1974 price levels, the recommended ice retention structure would reduce average annual flood damages in the lower basin from $212,200 to $58,800. Of these $58,800 in remaining average annual damages, $54,800 are in Subreach 1A, where backwater from the Buffalo River is the major cause of flooding. This substantial reduction in flood damages would result from lowering the flood stages in those reaches where ice jamming usually occurs. The degrees of protection by subreach with and without the recommended structure are shown in Table 4. The effects of the selected plan in each subreach of the lower basin are discussed below.

There would be very little flood damage reduction in Subreach 1A because ice stages and free flow stages are identical. Most damages in this reach are due to basement flooding resulting from a combination of overland flow and storm sewer backup. High stages in this subreach usually result from backwater effects from the Buffalo River, not ice jamming on Cazenovia Creek. The need for the City of Buffalo to continue ice breaking activities in this reach may well be eliminated by construction of the ice retention structure.

In Subreach 1B, the stage for the 1-percent flood event would be reduced by approximately 3 feet.

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In Subreach 2A, the water level that has a 1-percent chance of occurrence each year would be reduced by approximately 3 feet following construction of the recommended ice retention structure. The chance of flood damage occurrence in any one year would be reduced from 40 percent to approximately 10 percent.

Subreach 2B consists primarily of low, largely undeveloped floodplains. Most flood damages occur to commercial units and public utilities. Flooding due to ice jams results in only about $100 damages per year in this subreach; therefore, the benefit that would be provided by the ice retention structure would be small.

Subreach 3A is similar to Subreach 2B, i.e. low, largely undeveloped land. The average annual damages in this area are less than $100 under existing conditions. The ice retention structure would reduce stages in this reach which may make it more feasible to develop the land in the future; however, the reduction in damages to existing developments is small.

In Subreach 3B, the ice retention structure would reduce stages by up to 5 feet for a 1-percent probability discharge. This large reduction in flood stages reduces the average annual damages from over $104,000 to approximately $100. The chance of a damaging flood occurring each year would be reduced from greater that 30 percent to less than 1 percent.

Substantial benefits also occur in Subreach 3C, which contains Southgate Shopping Plaza. The chance of water reaching the Plaza parking area or the houses upstream of Union Road would be reduced from 40 percent to four percent on an annual basis. The accompanying reduction in average annual damages would be nearly $10,000.

Construction of an ice retention structure does not preclude construction of a system of reservoirs to protect against a SPF in the Buffalo River Basin. Further, an ice retention structure would have no effect on operation of a flood control reservoir further upstream on Cazenovia Creek. A SPF occurring in Cazenovia Creek Basin with an ice retention structure in place but without a reservoir upstream would not aggravate or increase flooding effects of a SPF.

Transient effects due to construction activities would be experienced. Noise, dust, mud, and exhaust fumes are to be expected during construction of the ice retention structure. However, because of the rather isolated location of the proposed works, few if any residents would be inconvenienced, endangered, or otherwise adversely affected by such activities. Stream turbidity and siltation downstream from the site would temporarily increase. Fish and motile aquatic organisms might be driven away temporarily.

More serious are effects which can be expected to last the duration of and in some cases beyond, the useful life of the project. The temporary increase in siltation may smother sedentary organisms and destroy spawning beds, resulting in long-term degradation. Although the selected plan does not call for a permanent pool, should local parties elect to have one, it may induce algal blooms in water already capable of supporting large algae populations. A permanent pool would include approximately 5 acres of shallow pool upstream of the ice retention dam, possibly providing breeding ground for mosquitoes or other insect pests. Upstream from this area, the pool would be confined to the existing stream channel under normal flow conditions. Lasting effects of a more beneficial nature might also be experienced with a permanent pool. Siltation downstream might decrease following construction because of increased sedimentation in a permanent pool. Such a pool might support sizable populations of small panfish or bass, in which case it could be managed and developed as a local fishery resource.

The proposed project site is a flat, marshy scrubland, supporting isolated stands of black willow, eastern cottonwood, and boxelder. Approximately 30 to 40 acres have been cleared for agriculture. The site provides habitats for songbirds, pheasant, eastern cottontail, and various other small mammals. A total of 15 acres of this habitat would be disrupted during construction, 5 acres of which would be excavated to provide for the stilling pool. Most of the remaining 10 acres would be restored. Natural resources would be consumed during construction. These include oil products, steel, lumber, and materials for concrete.

Incorporated within the selected plan are measures designed to integrate the proposed works within the surrounding environment. Seeding and selected plantings of appropriate tree species are provided for. The ice retention structure would be constructed and tended in such a manner as to augment the aesthetic value of the project area. The ponding area immediately upstream of the dam might become an unattractive mudflat after occasional flooding from runoff exceeding the capacity of the drainage culverts. However, should local parties decide to maintain a permanent pool, it would provide a pleasing contrast in a long reach where the creek is often so shallow that its bed is exposed. Overall, the ice retention structure and pool could have a generally positive aesthetic effect, although the site might assume an unnatural manicured character.

The selected plan would have little negative effect upon the social well-being of Cazenovia Creek basin residents. No families or farmsteads would be displaced by the project. The area possibly impacted by floodwaters ponding behind the ice retention structure, approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland, would have to be purchased or flowage easements obtained. No public service, business, or industrial activity would be disrupted. One abandoned storage shed would have to be razed or relocated. No direct effect upon community cohesion or employment would be anticipated. In areas protected by the proposed works, property values would reasonably be expected to rise somewhat. While over 80 acres of residentially zoned land in West Seneca would be lost to residential development, the natural condition of this land is such that development would be difficult and at odds with the basic tenets of floodplain management.

The selected plan would benefit the health and well-being of basin residents by greatly lessening the threat of serious flooding and its consequences. These include property damage, disruption of traffic and public services, and health hazards due to debris, vermin, or water-borne infection. In addition, flood protection also provides intangible psychological comfort to residents of flood-prone areas.

Floodplain management by municipal authorities to control development of the Cazenovia Creek floodplain, will minimize the impact of future floods. Such control will complement State and county development plans, which call for the creation of "environmental corridors" flanking streams and lakes to preserve and provide public access to such valuable natural features. Furthermore, the proposed measure could easily be integrated within any larger parkland-recreation complex envisioned by municipal planners.

DESIGN, CONSTRUCTION, AND OPERATION AND MAINTENANCE ASPECTS

The location and general design of the ice retention structure are shown on Plates 9 and 10. The dam would span the creek and adjacent floodplain with an overall length of approximately 900 feet and would consist of a two-stage weir.

The low-stage weir, approximately 250 feet long (Section A-A on Plate 10), would have a crest elevation of 639 feet and maximum height of 9 feet above the creek bottom. An 11-acre pool would be created behind the dam when the drainage conduits were closed, with normal flows passing over the crest of the low-stage weir. This weir is designed to pass the 100-year discharge of 16,800 cfs. A stilling basin would be located immediately downstream from it to reduce velocities during flood conditions. The stilling basin would span the creekbed and extend approximately 100 feet downstream of the dam. Three gated 36-inch conduits would be placed beneath the low-stage weir to permit drainage of the pool for the period of year the ice retention function is not needed, or for maintenance and sediment removal.

An ice boom, shown on Plate 10, would be anchored upstream of the dam to extend across the mouth of the low stage weir. The boom would promote formation of a stable ice cover on the pool. The stream flow would pass under the stable cover and discharge over the lower weir.

A high-stage weir (Section B-B on Plate 10) would have a crest elevation of 647 feet and would extend approximately 650 feet from the right side of the low-stage weir to high ground along Seneca Street. The ice retention structure is designed to allow the Standard Project Flood (77,000 cfs) to pass over the dam without overtopping the abutments. Both ends of the dam would be tied into high ground by means of wingwalled abutments. Each abutment would have a top elevation of 660 feet allowing 3 feet of free board above the Standard Project Flood level.

The above-described configuration of the ice retention structure will be investigated during the Implementation Study (Advanced Engineering and Design Study) to verify both its structural and functional adequacies. Specific investigations will be made to determine the effects of possible loadings on the ice boom and dam; the ice-retaining efficiency of the ice retention structure; the erosive effect of possible two-stage flows on lands downstream from the dam and the functional adequacy during design and greater than design flow conditions. With the SPF, flooding conditions would be the same with or without the project.

Construction of the ice retention structure would require two phases. Phase 1 would consist of diversion of the creek to the right side of the valley and construction of approximately 400 feet of the dam. Cofferdams and pumps would be required during this phase of construction. During Phase 2, the creek would be directed over the completed portion of the structure. The remaining 500 feet of the structure would be completed and the creek and surrounding land restored.

An access road to the site of the proposed dam would be required during construction. The road could be converted to a maintenance and safety patrol road. Most buildings, structures or other types of improvement works that are unattended have potential of being frequented by people either for curiosity, vandalism or for a place to recreate. The dam would be hidden from view except from the top of the banks near the proposed site or from creek level a short distance from the dam. It will be necessary, therefore, that non-Federal interests responsible for maintenance of the ice retention structure recognize the potential hazard of people being injured or endangered and not being noticed. The location and design of a multi-purpose maintenance and safety patrol road will be carefully considered in the detailed design of the ice retention structure to insure maximum safety of people in the area.

ECONOMICS OF THE SELECTED PLAN

The economic criteria and preliminary economic evaluation used in the plan selection and formulation were discussed earlier. This section presents a detailed economic analysis for the structural feature of the selected plan, namely the ice retention structure. This analysis included consideration of total first cost; annual costs, including operation and maintenance; flood control benefits; possible land enhancement and sedimentation benefits; and the impact of future growth and development.

COSTS

The detailed estimate of first costs for the recommended ice retention structure is given in Table 14. The costs shown are based on October 1974 price levels. Allowances of approximately 15 percent of costs for lands and damages and 20 percent of costs for all other items were used for contingencies. The costs shown in Table 14 are based on outright purchase of all lands affected by the flood pool of the ice retention structure. However, consideration could be given to purchasing only those lands required for the dam itself and the possible stable pool, with flowage easements being obtained on the lands affected by the flood pool.

Annual costs for the selected plan are based on an interest rate of 5-7/8 percent and an amortization period of 100 years. Since the ice retention structure could be constructed within one year, interest during construction was not included. Annual charges for maintenance of the proposed improvements are based on annual installation and removal of the ice boom, occasional structural maintenance, and periodic removal of the sediment trapped behind the dam. The estimated annual costs are presented in Table 15.

BENEFITS

As discussed previously, the lower basin was divided into three flood damage reaches, each of which was divided further into subreaches (see Table 3 and Plate 2). These reaches were established by geographic and land-use features wherever possible to facilitate economic analyses of separable areas subject to flooding.

Flood damages for the reaches and subreaches in the lower Cazenovia Creek basin were evaluated for the mid-1972 level of development. The average annual damages for ice-affected and free flow conditions, presented in Tables 16 and 17 respectively, were determined from stage-frequency and stage-damage curves, with results updated to October 1974 prices.

TABLE 14

DETAILED ESTIMATE OF FIRST COSTS FOR THE RECOMMENDED ICE RETENTION STRUCTURE

Item	Quantity	Unit	Unit Cost(1)	Estimated First Cost(2)		
				Federal	Non-Federal	Total
Land	95	Acre	$2,200.00		$209,000	$ 209,000
Clearing	15	Acre	750.00	$ 11,300		11,300
Beautification following Construction		L.S.		31,000		31,000
Dewatering and Access		L.S.		86,000		86,000
Excavation						
Common	10,600	C.Y.	1.87	19,800		19,800
Rock	1,050	C.Y.	15.50	16,300		16,300
Drainage Culverts and Control Gates		L.S.		7,500		7,500
Ice Boom		L.S.		81,400		81,400
Non-reinforced Concrete	125	C.Y.	163.00	20,400		20,400
Reinforced Concrete	4,900	C.Y.	65.50	321,000		321,000
Contingencies				134,500	31,400	165,900
Total Construction Cost				$729,200	$240,400	$969,600
Engineering and Design (13%)				94,800		94,800
Supervision and Administration (10%)				72,900		72,900
Total First Cost				$896,900	$240,400	$1,137,300
Rounded First Cost				$897,000	$240,000	$1,137,000

(1) October 1974 price levels

(2) Costs are rounded to the nearest one hundred dollars.

(3) Contingencies are assumed to be 15 percent for lands and 20 percent for all other items.

TABLE 15

INVESTMENT COSTS AND ANNUAL COSTS FOR THE RECOMMENDED ICE RETENTION STRUCTURE

	Costs (1) (2)		
Item	Federal	Non-Federal	Total
Investment Costs			
Rounded First Cost	$897,000	$240,000	$1,137,000
Interest During Construction	—	—	--
Total Investment Cost	$897.000	$240,000	$1,137,000
Annual Costs			
Interest and Amortization (100-year economic life @ 5-7/8 percent)	$ 52,900	$ 14,100	$ 67,000
Operation, Maintenance, and Replacement	900	10,500	11,400
Total Annual Costs	$ 53,800	$ 24,600	$ 78,400(3)

(1) October 1974 price levels.

(2) All costs are rounded to the nearest hundred dollars.

(3) Should the total investment cost be afforded completely at the end of construction, then the total out-of-pocket expense would be the total investment cost plus 100 (life of structure in years) times $11,400 (annual operation, maintenance and replacement cost), or $2,277,060.

TABLE 16

EXISTING AVERAGE ANNUAL FLOOD DAMAGES

Damage Area	Average Annual Damages (1)
Subreach 1A	$ 72,100(2)
Subreach 1B	10,400
Subreach 2A	13,400
Subreach 2B	1,800
Subreach 3A	100
Subreach 3B	104,300
Subreach 3C	10,100
Tannery Brook	16,500
Total	$228,700

(1) October 1974 price levels; for development existing in mid-1972.

(2) This amount includes the amount allocated annually by the City of Buffalo for the use of amphibious vehicles for ice-breaking activities.

Benefits to future development have not been included as future use and development of flood-prone areas will be controlled by implementation at floodplain management measures. Benefits from floodplain management for future development have not been included for structural measures but would accrue.

TABLE 17

REMAINING AVERAGE ANNUAL DAMAGES AFTER CONSTRUCTION OF THE ICE RETENTION STRUCTURE

Damage Area	Average Annual Damages[1]
Subreach 1A	$54,800[2]
Subreach 1B	1,400
Subreach 2A	400
Subreach 2B	1,700
Subreach 3A	100
Subreach 3B	100
Subreach 3C	300
Tannery Brook	16,500
Total	$75,300

[1] October 1974 price levels; for development existing in mid-1972. The damages do not reflect those that would result from a SPF.

[2] Reflects damage reduction from discontinuance of ice patrols.

The primary effect of the ice retention structure on flood conditions would be to reduce ice-affected stages. The economic benefits derived as a result of the stage reductions ($153,400) are the difference between average annual damages under existing ice-affected conditions (Table 16) and average annual damages to be expected with free flow conditions (Table 17).

In addition to benefits attributable to existing development, benefits due to economic growth were also considered. The affluence factor is an estimate of the increase in future flood damages to contents of residential development due to economic growth in an area. Future flood damages must be adjusted to account for the added value of contents in the flood plain during the project life due to rising per capita income. Total value of contents subject to damage are limited to a maximum of 75 percent of the total value of the structure.

One measure of the area's future economic growth is the prediction of future per capita income. Per capita income in the Buffalo SMSA is projected to increase from $3,569 in 1970 to $13,700 in 2020, according to 1972 SERIES E-OBERS income and employment projections. The curve of per capita income predicted by OBERS during this period closely resembles a deferred growth curve. The 50-year increase of $10,131 ($13,700 - $3,569) was multiplied by .2987, the average annual equivalence factor assuming deferred growth, to produce an equivalent annual per capita income increase of $3,026. This figure was then divided by the 1970 per capita income to determine the average percentage increase in per capita income. The 85 percent increase in per capita income was used as the upper limit for increasing the real value of residential contents in the future.

Information on the number, age, and average value of homes in the damage reaches was used to estimate the total value of residential structures in the flood plain. Total value of residential contents was estimated by reach with contents percentages ranging from 30 to 50 percent of the structural values with an overall average of 45 percent. Contents were therefore allowed an average increase of 30 percent during the project evaluation period to the maximum of 75 percent.

Future growth in per capita income anticipated by OBERS, when used as a measure of the economic growth factor and applied to the value of existing residential contents, would exceed the designated limit specified by current guidelines (1.85 x .45 or .83). Instead, the maximum economic growth factor under existing conditions is 1.65 (1.65 x .45 = .75) which is the basis for increasing average annual damages to residential contents. The factor of 1.65 is applied only to damages to residential contents and not to structural damage. The effect of the affluence factor upon project justification is indicated in Table 18.

In addition to benefits from the reduction in flood damages to existing developments as discussed earlier, other less quantifiable benefits can be attributed to construction of the ice retention structure. These would include: possible land enhancement of undeveloped areas in Subreaches 2B and 3A as a result of reduction in maximum flood stages, increased opportunities for parkland development, a more aesthetically pleasing flood management measure than floodwalls or levees, and possible reduction in downstream sedimentation problems.

However, there would be little change in land use with the project as there would be minimal protection provided in subreaches 2B and 3A. The vacant land would still be subject to flooding and should be zoned for no development unless for parkland development.

ECONOMIC JUSTIFICATION

A summary of the results of the economic analysis for the selected plan for flood protection for Cazenovia Creek and Tannery Brook is shown in Table 18. The ice retaining structure would result in total annual benefits of $153,400 at an average annual cost of $78,400, giving a benefit/cost ratio of 1.96. Consideration of future economic growth in the study area, as measured by rising per capita income, increases the Benefit cost ratio to 2.61.

TABLE 18

SUMMARY OF BENEFIT/COST ANALYSIS OF THE SELECTED PLAN

	Without Affluence(1)	With Affluence
Rounded annual benefits	$153,400	$204,300
Rounded annual costs	$ 78,400	$ 78,400
Net annual benefits	$ 75,000	$125,900
Benefit/cost ratio	1.96	2.61
Remaining annual damages (exclusive of Subreach 1A and Tannery Brook)	$ 4,000	$ 5,700
Remaining annual damages in Subreach 1A	$ 54,800	$ 78,300
Remaining annual damages in Tannery Brook	$ 16,500	$ 23,600
Total remaining annual damages in Cazenovia Creek basin	$ 75,300	$107,600

(1) Based on October 1974 price levels and mid-summer 1972 level of development and allowance for discontinuance of ice-breaking activities by the City of Buffalo. An affluence factor of 1.65 was applied to damages to residential contents but not to structural damage to determine affluence benefits.

DIVISION OF PLAN RESPONSIBILITIES

This section presents details of responsibilities and apportioned costs that Federal and non-Federal agencies would have to bear to implement the recommended plan. Since the recommended plan provides only for flood damage reduction, costs and benefits for other possible features, such as recreation, are not included.

COST APPORTIONMENT

Apportionment of cost between Federal and non-Federal interests for the ice retention structure of the recommended plan is based on existing Federal legislation and administrative policies governing flood management. In this regard, all costs associated with construction of the ice retention structure and aesthetic treatment would be assigned to the Federal Government. Local interests would provide all lands, easements, and rights-of-way; pay for all grade change damages; and make necessary relocations and/or modifications of utilities. Operation and maintenance costs would be largely a non-Federal responsibility, with Federal costs limited to occasional inspections.

The apportionment of first costs, including appropriate engineering, design, supervision, and administration costs, is shown in Table 14. The distribution of investment costs and estimated annual charges, based on a 5-7/8 percent interest rate and a 100-year project economic life, is given in Table 15. Since the ice retention structure could be constructed within one year, interest charges during construction were not included.

An important aspect of the plan for Cazenovia Creek Basin is the establishment of a well-managed floodplain regulation program via participation by local governments in the National Flood Insurance Program. Land-use controls and other measures implemented by local governments to guide floodplain development and redevelopment to lessen future flood damages are important to the long-range success of the selected plan for construction of an ice retention structure.

PLAN IMPLEMENTATION

The steps necessary to implement the proposed plan for flood management along Cazenovia Creek are summarized as follows:

a. This report must be reviewed by the Corps of Engineers' North Central Division, the Board of Engineers for Rivers and Harbors, and the Office of the Chief of Engineers.

b. The Chief of Engineers must seek formal review of the report and comments by the Governor of New York and interested Federal agencies.

c. Following the above reviews, the Secretary of the Army must obtain comments of the Office of Management and Budget regarding the relationship of the proposed project to the President's program. The final report of the Chief of Engineers must then be forwarded by the Secretary of the Army to the House of Representatives.

d. The Committee on Public Works of the House of Representatives then must review the report and conduct hearings regarding it. Then, provided the Committee concurs in the recommendations of the report, Congress shall authorize the proposed project for flood management.

e. If the project is authorized, the Chief of Engineers will request that funds be included by Congress in his budget for design and construction.

f. If initial funds are appropriated, formal assurances of local cooperation would be requested from the State of New York, Department of Environmental Conservation, the official project sponsor.

g. The Buffalo District would review the findings of the feasibility study, reconsidering alternative plans and providing more detail on the recommended plan. This investigation would result in a Phase I General Design Memorandum (GDM).

h. Provided that the findings of the feasibility study were reaffirmed in the Phase I GDM, the Buffalo District would prepare Phase II GDM plans, specifications, and cost estimates; invite bids; and award a contract for construction. Necessary local actions, including furnishing necessary lands and payment of cash contribution, would be required at this time.

i. Upon completion of construction, local interests would commence project operation and maintenance.

j. Local interests would develop and enforce floodplain regulations in the area.

It is not possible to accurately estimate a schedule for the above steps. However, if the project is authorized and initially funded, it would take about 3 to 4 years to complete designs and construction, provided subsequent funds were appropriated as needed.

COORDINATION WITH OTHER INTERESTS AND PUBLIC INVOLVEMENT

Coordination among Federal, State, and local interests was an important part of this study. Close coordination was maintained with the Town of West Seneca, where the major flood damages occur, the City of Buffalo, the Village of East Aurora, the N.Y. Department of Environmental Conservation, the Erie and Niagara Counties Regional Planning Board, and other local interests in an effort to reach a mutually agreeable solution to water and related land resource problems in the Cazenovia Creek basin. Valuable inputs were also received during the study from the U.S. Soil Conservation Service, the U.S. Fish and Wildlife Service, HUD, the National Park Service, the U.S. Environmental Protection Agency, and local conservation interests regarding fish, wildlife, and other environmental resources in the study area.

Public meetings were held in West Seneca on 11 December 1959 and in Elma on 24 August 1962. Most of the testimony was given by county, town, and city officials of the localities affected by flooding. Considerable data on flood damages were received.

Contact with the New York State Department of Environmental Conservation has been maintained over the last few years. It has spent several years studying the water resources in the portion of Western New York known as the Erie-Niagara Basin. Its report presents a comprehensive plan for water resources management and development in the Erie-Niagara Basin; however, its detail is not equal to that of this report. The State has expressed a desire for major Federal participation in its water resources plan and has held a series of public information meetings to determine public reaction to projects being considered in its report. Generally, there was opposition to the proposed reservoir projects by those whose properties lie within the reservoir areas and acceptance by those who would stand to benefit. On 29 June 1971, the State held a public hearing on the Erie-Niagara Basin Comprehensive Water Resources Plan. Generally speaking, no significant opposition was directed to the plan as a whole. However, opposition was expressed relative to certain proposed reservoir projects, including one site at Spring Brook. This reservoir project was deleted from the plan by Mr. Henry L. Diamond, Commissioner, Department of Environmental Conservation, on the grounds that more acceptable alternatives should be investigated further before a final decision is made on incorporating this element in the plan.

A workshop was held on 7 December 1973 to apprise interested local governmental bodies and agencies of the measures considered, the tentative selected plan, and the economic, social, and environmental effects of all plans considered.

An early stage public meeting was held on 11 December 1973 and a late stage public meeting was held on 21 June 1974. Both meetings were held in West Seneca Senior High School and were well attended. Additional meetings were held with local interest groups on 22 August, 28 August, and 13 September 1973 and 8 March 1974.

At the late stage public meeting held on 21 June 1974, several plans for flood management were presented to all interested parties to ascertain their views and to insure that one of the considered plans would be acceptable. At the meeting, local government officials and interested individuals expressed support for alternative levee measures to protect various portions of Reach 3. However, concern over the backwater effects of some levee alignments was expressed by individuals residing on the left bank of the creek and those in the presently developed Southgate area.

The City of Buffalo expressed concern that the proposed plans would not relieve flooding in the lower reaches of Cazenovia Creek, and that the levee would increase flooding problems downstream of Reach 3. The possibility of ice retention was discussed and favorably received by the public.

Written comments from Federal, State, and local agencies as well as individuals are appended at the end of this section.

Subsequent to the 21 June 1974 late stage public meeting, a reexamination of the measures considered based on responses at the public meeting and new stage-frequency and stage-damage data resulted recommended plan. Since this measure was not considered in detail at the 21 June 1974 public meeting, a second public meeting was held 26 November 1974 to present and thoroughly discuss the ice retention structure. Comments on the recommended plan from various Federal, State, and local agencies, as well as individuals, have been solicited and considered carefully in preparation of this report.

SUMMARY

This investigation has verified the existence of flood-related problems along Cazenovia Creek. Governmental entities in the area for which flood problems were identified include the City of Buffalo, the Town of West Seneca, and the Village of East Aurora. Various flood management measures including nonstructural and structural measures and combinations thereof were evaluated to determine if flood damage reduction is feasible.

Although floodplain regulation would by itself preclude most damages to future development, it would do little for existing floodplain development in the Cazenovia Creek basin. Floodplain regulation is, however, considered a necessary complement to the recommended plan. Flood insurance would partially compensate for flood damages incurred, but would not reduce flood damages or related social problems. Permanent evacuation of the affected floodplains of the basin would be socially disruptive, economically infeasible, and unacceptable to local interests. Upstream floodwater storage, via a reservoir at Spring Brook, would be economically infeasible. Major levee works along Cazenovia Creek to provide a 100-year degree of protection would be economically unjustifiable. Floodproofing would be economically feasible only in Reach 3. However, the recommended ice retention structure provides greater protection than the floodproofing measure and has a considerably higher economic return.

Based on plan formulation analyses, construction of an ice retention structure, participation in the National Flood Insurance Program, and floodplain management would provide the best solution to flood problems in the Cazenovia Creek basin. The proposed plan would also be fully compatible with a comprehensive plan of water resource management and development for the Buffalo Metropolitan Area.

The proposed flood management plan includes construction of the ice retention structure shown on Plate 4, approximately one mile upstream of Union Road. Specific designs would be prepared during the post-authorization study phase and would be coordinated with local interests to assure campatibility with both the natural and human environment. Aesthetic treatment and possible recreational facilities would be included in the final design.

Estimated total first costs for the proposed project would be $1,137,000. Annual costs and annual benefits would be $78,400 and $153,400, respectively. The overall benefit-cost ratio is 1.96, excluding effects from future economic growth.

Construction would be funded by the United States after congressional authorization and after receipt of the non-Federal share of the cost. The Federal share of the proposed project first cost would be $897,000 and the non-Federal share would be $240,000. Following construction, non-Federal interests would commence operation and maintenance of project facilities and make major replacements as required.

A draft environmental statement has been prepared concerning the proposed plan of improvement. Comments have been requested from all interested parties. Comments received have been attached to the revised draft environmental statement submitted with this report.

STATEMENT OF FINDINGS

I have reviewed and evaluated, in light of the total public interest, the reports, studies, and other documents compiling data concerning the proposed action. Similarly, I have also reviewed and evaluated the views of other agencies and the public, relative to various plans of improvement affecting the balance of values in accomplishing flood damage reduction along Cazenovia Creek. I have studied and analyzed the possible consequences of these plans, considering engineering feasibility, environmental effects, economic factors, and social well-being of the people. I have also considered the costs and means of eliminating, minimizing, or ameliorating possible adverse environmental, social, and economic effects.

Wherever adverse effects have been found to be involved, consideration has been given to mitigating measures. In some instances, proposed project features have been redesigned to minimize adverse effects. In other instances, minor adverse environmental effects cannot be avoided unless unreasonable design changes would be made in the recommended measures, thereby negating the intended project purposes. Recognizing that evaluation of the recommended project involves certain minor adverse consequences, I find that the action leading to such adverse effects is nonetheless justified by overall project considerations.

In light of these findings, I am convinced that the action as proposed in the following recommendation is based upon consideration of all appropriate alternative courses of action for achieving the stated objectives; that the proposed action is fully consistent with national policy, laws, and administrative directives; and that in general the total public interest is best served by its implementation.

RECOMMENDATIONS

I recommend authorization of the plan presented herein, as may be modified by the Chief of Engineers, providing for an ice retention structure on Cazenovia Creek in the Town of West Seneca, New York first costing the United States an estimated $897,000 and non-Federal interests an estimated $240,000, or annually costing the United States $53,800 and non-Federal interests $24,600, including $10,500 for maintenance and operation, provided that, prior to construction, and in accordance with Section 221 of the Flood Control Act of 1970, local interests furnish assurances satisfactory to the Secretary of the Army that they will:

a. provide, without cost to the United States, all lands, easements, and rights-of-way necessary for the construction of the project, now estimated at $240,000;

b. accomplish, without cost to the United States, all relocations of highways, highway bridges, buildings, utilities and special facilities;

c. hold and save the United States free from damages due to the construction works, except damage due to the fault or negligence of the United States or its contractors;

d. maintain and operate the project after completion, including any aesthetic mitigation measures that may be incorporated in the final report design, in accordance with regulations prescribed by the Secretary of the Army, currently estimated at $10,500 annually; and

e. prevent any encroachment on constructed works and into areas required for the ice retention structure's flood pool that would interfere with the proper functioning of the project.

BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

[First endorsement]

NCDPD-PF(Mar 75)
SUBJECT: Interim Report of Flood Management in Cazenovia Creek Watershed

DA, North Central Div., CE, Chicago, Ill. 2 2 APR 1975

TO: HQDA (DAEN-CWP-C) WASH DC 20314

I concur in the recommendations of the District Engineer.

W. O. BACHUS
Brigadier General, USA
Division Engineer

SECTION H

CORRESPONDENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place, Cortland, NY

March 7, 1975

Div.
Ofc.
Office of Comptroller
EEOD
EOP
Public Affairs Ofc.
Safety Ofc. (VS)
Procurement & Supply Div.
OAS
ADP
Cleveland Resident Ofc.
Personnel Office

Colonel Bernard C. Hughes,
District Engineer
U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

This is in response to your letter of November 22, 1974 requesting our comments on the draft Phase II report on Cazenovia Creek, New York.

These preliminary comments are submitted by the U.S. Fish and Wildlife Service and are not the views of the U.S. Department of Interior within the meaning of Section 2(b) of the Fish and Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Further review will be undertaken by the Service during the Departmental review process when the Departmental position will be provided.

The proposal includes several non-structural plans and an ice retention structure to be constructed about one mile upstream of Union Road. The ice retention structure is a new proposal developed late in the planning process. It is a major change from the levee-floodwall alternatives considered earlier.

We favor the ice retention structure proposal and agree that it makes more sense to try to prevent the ice jams which cause the flooding rather than to try to protect against the flooding. The ice retention structure should be less expensive and will be less damaging to the environment than the prior levees and floodwalls proposal.

Specific comments on the report follow. On page 79 the effects of the ice retention structure are discussed and the possible uses for the pool are presented. Formation of a stable pool, if appropriate, will require more detailed studies on fisheries potential, recreation, pest control, and public health and safety. The design of the outfall structure and low-stage weir are important factors in this regard. Continued coordination will be required on these problems related to the design and operation of the project.

A major recommendation presented in the selected plan is the non-structural feature of floodplain management, namely, participation in the National Flood Insurance Program. It is not clear as to the reason why this non-structural feature is not required rather than recommended. We feel that a discussion of this would be relevant since flood plain management is an integral part of the proposed plans.

The environmental setting and natural resources of the project area are presented in the report on pages 9-16. Although a description of the natural vegetation is provided on page 12, it does not include a listing of the plants in the project area. The same holds true for the animal species in the project area. Without accurate surveys there is no way of knowing if threatened or endangered species are present in the area or if there are other significant plant or animal resources. The draft environmental statement for this project contains a list of plants which includes the species _Euonymus obovatus_ Nutt., Running Strawberry Bush, which has been designated as a protected native plant in New York State (N.Y.S. Environmental Conservation Law, Section 9-1503). Inventories of the biological resources of the project area and analysis of the status of the species present are needed.

We appreciate the opportunity to comment on the draft Phase II report and look forward to providing more meaningful comments on the final report.

Yours sincerely,

Willard W. Cole, Jr.

Willard W. Cole, Jr.
Area Office Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
700 East Water Street, Syracuse, New York 13210

December 18, 1974

Colonel Bernard C. Hughes
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207
cc

Dear Colonel Hughes:

We have reviewed the two volumes of the draft Phase II Report on Cazenovia Creek, New York (Interim to the Buffalo Metropolitan Area Study), dated November 1974, prepared by the Buffalo District Corps of Engineers.

The following comments are submitted:

(1) Page 41 - 1st completed paragraph

The second sentence should be rewritten to state, "In addition, the County Soil and Water Conservation Districts, with SCS assistance, are conducting a program of vegetative plantings for bank stabilization purposes." Although some tree planting may be helpful, the use of shrub type willows is a more desirable bank protection vegetative measure.

(2) We note that the report includes a letter with our previous comments on this project. Although the comments regarding Land Treatment Programs and Soil and Water Conservation District Programs are not mentioned in these latest reports, SCS believes these are important measures that should be considered in such programs.

(3) Appendix E-4 - last paragraph

This paragraph notes 'Heavy emphasis is placed on this nonstructural feature .... basin." A number of groups regard proper land use and land treatment as a nonstructural measure. These ideas would improve this paragraph.

(4) Appendix E-10 - Paragraph entitled "Water Pollution and Aquatic Ecology"

This paragraph discusses "siltation downstream" during construction and its transient effects. The concern from such effects can be lessened by mentioning that prompt vegetative measures (lime, fertilizing, seeding) will be taken during and following construction to minimize degradation of water quality.

We appreciate the opportunity to comment on this proposal.

Sincerely yours,

Robert L Eddleman

for Robert L. Hilliard
State Conservationist

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

DEC 17 1974

Colonel Bernard C. Hughes
District Engineer
Buffalo District, Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have received a copy of the draft Phase II report on Cazenovia Creek, New York and your request for comments on it.

Our comments will be coordinated in a single agency response and sent to you separately.

Sincerely yours,

Charles N. Durfor
Chief
Water Branch

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
NORTHEAST REGIONAL OFFICE
Federal Building - Room 9310
600 ARCH STREET
Philadelphia, Pennsylvania 19106

IN REPLY REFER TO:

DEC 13 1974

Colonel Bernard C. Hughes
District Engineer
Buffalo District
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Dear Colonel Hughes:

We have reviewed the draft Phase II report on Cazenovia Creek, New York. Based on our review, we believe excellent outdoor recreation opportunities exist.

The homes and school which adjoin the proposed impoundment would be enhanced aesthetically if the potential problems of siltation and algal bloom are adequately dealt with. It is noted in the report that these problems may be minimized by periodic draining of the impoundment by local interests. We suggest that a program for water release be developed which is least disruptive to recreation activities, and that this program be recommended to those who will make the decision concerning release from the impoundment.

We also recommend that consideration for such recreation facilities as a beach, picnic tables, swimming float, and dock be included in your final report. Although present water quality may not be conducive to water contact activities, the construction of sewers mentioned in the draft report, should substantially remedy this problem.

It is noted in the report that, "Permanent evacuation of the affected floodplains of the basin would be socially disruptive, economically infeasible, and unacceptable to local interests." We believe that, although immediate evacuation of the floodplain is constrained for the above reasons, evacuation is the logical long-term goal of flood plain management, and should be considered by all interests. Its accomplishment over time would be by such techniques as floodplain zoning, building codes and selective placement of utilities.

We trust these comments will be helpful and we look forward to reviewing the final report.

Sincerely,

Anthony M. Corbisiero

ANTHONY CORBISIERO
DEPUTY Regional Director

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York XXXX 12233

JAMES L. BIGGANE
XXXXXXXXXXXXXXX
Commissioner

OFFICE OF PROGRAM DEVELOPMENT, PLANNING AND RESEARCH
PROGRAMMING AND ANALYSIS BUREAU

December 2, 1974

Colonel Bernard C. Hughes, District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

Receipt is acknowledged of ten copies of the draft Phase II Report on Cazenovia Creek, New York, transmitted with your letter of November 22, 1974 to Mr. Eichler.

Copies of the report have been circulated for review and comment by interested State and local agencies.

It will not be possible to complete our review and provide comments by December 18, 1974, as you have requested. Comments will be forwarded as soon as possible.

Per D. Konsella
March 6, 1975

Sincerely,

James Kelley
JAMES F. KELLEY
Chief, Water Management Programming Group

RLK/ea

STANLEY M. MAKOWSKI
Mayor

Department of Public Works
City of Buffalo, N. Y.

ROOM 502 — CITY HALL — BUFFALO, NEW YORK — 14202 — PHONE 856-4200 Ext. 301

Commissioner
JAMES J. MAC DONALD, PE.

November 26, 1974

Colonel Robert L. Moore
Corp of Engineers
1776 Niagara Street
Buffalo, New York 14207

RE: Cazenovia Creek Feasibility Report for Flood Management

Dear Colonel Moore:

This office has reviewed the Corps of Engineers Feasibility Report for Flood Management and it is my opinion that an ice retention structure in West Seneca will alleviate the problem of frequent flooding along Cazenovia Creek due to high run off and ice conditions.

Therefore, I recommend that this structure be built as soon as possible.

Very truly yours,

James J. MacDonald, P.E.
Commissioner of Public Works

JJM:RSS
JCL/blh

Thomas R. Mahlmeister
4825 Seneca Street
West Seneca, New York
26 November 1974

TO: Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

SUBJECT: FLOOD MANAGEMENT ALONG CAZENOVIA CREEK.

PERSONAL STAND: Highest degree of oposition to the proposed construction of a Dam and Ice Retention Structure at Mill Road Park, West Seneca New York.

LOGICAL REASONING BEHIND STAND:

1) With the ice retention structure, mounds of ice at least eight feet or more will be produced. The property from Mill Road up stream is totally unprotected from any entrance to the Creek Bed. Statistics can prove that this can be a great invitation for children to climb and roam about. Any one who has ever seen the ice breaking up and melting along any Creek or Lake Erie, can easily understand the potential danger that exists. Furthermore, facts from Police records of drownings along the Cazenovia Creek during the winter months will prove this statement. Emphasis to this potential danger of the mounds of ice can readily be seen in the photograph of one of the earlier circulars distributed by the Corps.

2) West Seneca presently has a several hundred acre natural game preserve along the bank of the Cazenovia Creek up stream from the Mill Road Park. With the ice retention structure, the wild life will positively be destroyed. The present existence of wildlife extends much greater than that described in earlier literature published by the Corps. As many as 30-35 Pheasants feed in my yard daily. Photographs are available to prove this. Numerour sightings of deer through the summer of 1974 are available. Large quantites of other wild life exist; Rabbit, Squirrel, Raccoon and extensive varieties of Bird life.

3) Definite destruction of privately owned land will be created. With no restriction, the water flow of the Cazenovia today, 24 of November, 1974 is approximately two feet below the creek bank. This water, being forced to over flow will cover 51730.25 square feet (more than one acre) of land which I pay tax on and utilize for farming. The soil condition is fine fertile top soil about 18 inches deep. Below that is soft sandy clay and then slate. The high bank of my property consists of soft gray slate and sandy clay. This bank is 447.3 feet from the Creek bank.

Erosion of this material would exist at an extremely high rate.
Under present conditions the creek bank rarely overflows and little distruction occurs. Distruction is primarly prevented by the present tree growth. Flooding this area would within, one year distroy all tree growth.

4) From a statement made by a representative of the Army Corps of Engineers "The ice retention structor will be an aid in the protection of Damage to endangered areas but can provide no guarantee of ice jams or flooding in this endangered area." The ice retention structor will definitly destroy property up stream from Mill Road, endangering private residents and business. It is, in my opinion, based on scientific evidence and facts based on history, the ice retention structor will do nothing more than shift the danger of distruction from one area down stream to another area up stream of Mill Road.

5) In the early 1950's an attempt to prevent flooding and erosion of the Cazenovia Creek Bank down stream from Cazenovia street was made by the errection of a dam approximately four feet high was constructed in Cazenovia Park. In the winter of 1957 the ice backed up from this dam sufficiently enough to drive ice accross the base ball dimonds up to Saint John's Parkside, across the Cazenovia Golf Course up to Seneca Street. The extent of damage created by this dam overwhelmed that of construction of retaining walls along Legioned Drive. Shortly after the winter of 1957 the dam was removed and retaining walls were constructed along the Creek bank at Legioned Drive.

CONCLUSION: As a private individual who will be affected by any alternative arrived at by the Army Corps of Engineers, I beg for careful consideration of all factors and a conclusion be based on a scientific basis rather than political and I urge you to abandon consideration of the dam and ice retention structure to be constructed up stream of Mill Road.

Presented here are a few facts which I feel the most important. Many minor facts could easily be presented. Each of these alone seem minor but added together DO present a serious problem. Just to touch on these minor FACTS without great detail are:

a) Raw sewage that enters the Cazenovia Creek.
b) The collection of debris that floats down the Cazenovia Creek during the high waters in winter.
c) Summer time conditions of the Creek.

Minor, But added together, collected at an ice retention structure do present a serious problem to all residents of West Seneca.

Thank you,

Thomas R. Mahlmeister
4825 Seneca Street
West Seneca, N.Y. 14224
PHONE: 716-675-9071

ERIE & NIAGARA COUNTIES REGIONAL PLANNING BOARD

Leo J. Nowak, Jr.
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November 26, 1974

Colonel Bernard C. Hughes
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Col. Hughes,

An evaluation statement of Cazenovia Creek Flood Management Proposals was made by Mr. Raymond Griffin, Chairman of the Regional Board's Utilities Committee at a previous public meeting on June 21, 1974.

The Regional Planning Board is resubmitting that statement and would appreciate having it placed on record as a statement of policy with regards to the proposals submitted by the Corps of Engineers at the Public Meeting on Cazenovia Creek Flood Management of November 26, 1974.

Yours sincerely,

Henry C. Jawor

Henry C. Jawor
Assistant Civil Engineer

HCJ/jo
Enc:

cc: Raymond Griffin, Chairman, Utilities Committee
Leo J. Nowak, Jr., Director (ENCRPB)
David Seigneur, Deputy Director (ENCRPB)

STATEMENT FOR PUBLIC HEARING ON IMPROVEMENT TO CAZENOVIA CREEK FOR FLOOD PROTECTION ON JUNE 21, 1974

My name is Raymond Griffin. I am here as the Chairman of the Utilities Committee of the Erie and Niagara Counties Regional Planning Board. It has been my fortunate experience to have also been Chairman of the Technical Advisory Committee for Storm Drainage which was subsequently responsible for the preparation of a Storm Drainage Design Manual and a Storm Water Management Plan through a grant from the United States Department of Housing Urban Development.

During this time the Regional Planning Board has come up with a plan to control flooding and to protect flood prone areas in the most cost effective way. The proposal presented here tonight as a recommended plan for Cazenovia Creek is consistent with the following programs prepared by the Regional Planning Board:

1. Land Use Plan
2. Recreation and Open Space Plan
3. Regional Water Supply Plan and Program
4. Regional Sanitary Sewerage Plan and Program
5. Storm Drainage Management Plan

The Regional Planning Board would like to go on record in favor of the proposed plan recommended by the United States Department of Army Corp of Engineer, Buffalo District. However, we would like to emphasize that the Corp of Engineers consider flood protection for Cazenovia Creek as a single regional unit rather than by separate reaches, as proposed.

It is our opinion that the benefit cost ratio used by the Corps of Engineers as a guideline for funding could very well include not only Reach 3 where structural measures were proposed, but also structural measures for Tannery Brook. This would still keep the benefit cost ratio well within governmental recommendations and guidelines and provide flood protection for the entire watershed of Cazenovia Creek.

We would also like to recommend Alternate 2 of the recommended plan for Reach 3 since this provides a potential recreation area in West Seneca which will conform to the recreational studies previously prepared by the Regional Planning Board.

We trust that the Buffalo District, United States Corp of Engineers will amend their report prior to its submission to the Chief of Staff for Federal approval and funding including those recommendations noted above.

We would again like to express our appreciation to the Buffalo District of Corps of Engineers for its assistance and cooperation in working with the Regional Planning Board.

85 Willowdale Drive
West Seneca, New York 14224
November 21, 1974

Army Corps Of Engineers
Cazenovia Creek Project

Gentlemen:

After attending the June meeting on Cazenovia flood control at West Seneca High School, I was distressed at the two alternative plans put forward by your department to solve our flooding problems. Trying to choose which was worse: the periodic flooding of our home by Cazenovia Creek or the proposed solutions which would

1)destroy the natural beauty of our home, replacing it with a permanent ugly scar

2)create a public nuisance as our backyards become a public thoroughfare and hangout

3) create a saftey hazard to the many young children whose yards would ajoin the structure

left us feeling that there must be another alternative.

We were therefore much relieved to hear of the proposed ice retention structure and the meeting to be held next week to explain it. Our experience with the flooding situation leaves us with the certain knowledge that our problem is one of ice buildup rather than flooding from runoff. We therefore heartily agree with the logic of an ice retention structure which attacks our problem straight on, rather than the earlier proposals which seem to try to remedy the effect, flooding, rather than the cause, ice buildup.

Sincerely,
Daniel A. Szeglowski
Daniel A. Szeglowski

Town of West Seneca
Erie County
1250 UNION ROAD
WEST SENECA, N. Y. 14224
674-5600

ENGINEERING DEPARTMENT
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TOWN ENGINEER

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JAMES A. ROOF

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November 4, 1974

Col. Bernard Hughes
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Re: Cazenovia Creek Basin
Water Resources Development

Dear Sir:

The recent newspaper story and public hearing announcement concerning this flood plain area, were referred to this department.

Although your comments, at the June 21, 1974, public hearing, were limited, they did convey the fact that a full review of the report would be made prior to a final decision. At this time, an inspection of the public testimony would do well, as the most pressing issue was not in the technical presentation, but in the necessity for diligence and continuing effort in developing and constructing a protection plan. It seems that at least a six month delay has been instituted by the miscalculations of the initial report.

Eventhough the Corps will prepare an agreement with the New York State Department of Environmental Conservation for land and operations costs of the planned works, it will be the Town of West Seneca which will inherit some of this responsibility from the State. Therefore, it was with much concern that the proposed public hearing was scheduled prior to any contact with the Town or the availability of the revised report.

In light of the recent difficulties the Corps encountered in preparing a plan of action for Ellicott Creek, please note that in the case of Cazenovia Creek, no really technical difference of opinion exists. As a matter of fact, this department suggested to the Corps in April, 1971, that the use of an ice retention facility might be the best course to follow. The progress in this matter only depends on the speed at which the final report is transmitted through the bureaucratic chain of command.

Please forward a copy of this revised report as soon as it becomes available so a proper review can be made at this level prior to the public meeting.

Very truly yours,

Wallace J. Ochterski, P.E.
Town Engineer

WJO/meb

cc: Town Board
NYSDEC, Konsella
file, Flood Plain Study
Cazenovia Creek

WEST SENECA CHAMBER OF COMMERCE, INCORPORATED

1747 Union Road, West Seneca, New York 14224

Telephone: 674-2224

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NICHOLAS GENTILE
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GERALD J. GREENAN
Greenan & Whelan, Attorneys

WILLIAM C. KURTZ
Retired

1975

HARRY S. BYRD
Wyandotte Cement Company

WILLIAM H. GRASER
William's Florist

HARRY E. GREY
B. W. Morris & Son, Inc.

DONALD P. KIRSCH
General Insurance

LEO S. STYBORSKI
Arrow Sheet Metal Works of Buffalo, Inc.

1974

GEORGE A. ALBRECHT
Liberty National Bank & Trust Company

G. WILLIAM COPPOLA
Accountant & Insurance Broker

ROBERT F. JOHNSON
Bob's Collision

GEORGE J. PAUL
Bisonite Co., Inc.

ELIZABETH P. PIERCE
Buffalo Savings Bank

September 17, 1974

Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Gentlemen:

Please be informed that at its recent Board of Directors meeting, the West Seneca Chamber of Commerce went on record as being in favor of Alternate Plan #2 for the Cazenovia Creek Flood Control.

Sincerely yours

Harry E. Grey
President

mg

c.c. - The Hon. Jack F. Kemp
West Seneca Town Board

New York State Department of Environmental Conservation

James L. Biggane
~~Henry L. Diamond~~,
Commissioner

September 4, 1974

Colonel Bernard C. Hughes, District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

This is to advise you that this Department intends to provide assurances of local cooperation for the proposed flood control project on Cazenovia Creek at West Seneca, New York, provided the recommended plan meets the needs of local and State interests.

At its meeting on August 5, 1974, the Town Board of the Town of West Seneca passed a motion favoring the construction of flood control facilities on Cazenovia Creek and further recommending that Alternate No. 2 be preferred in general concept. We endorse this recommendation.

The draft Phase II Report on Cazenovia Creek has been reviewed and comments on recommendations for Reach 3 are offered on the attachment to this letter.

No comments for other portions of the Basin can be made until more detailed proposals are made following additional study.

Sincerely,

Thomas P. Eichler

Thomas P. Eichler
Director, Office of Program Development,
Planning and Research

COMMENTS FOR REACH 3 - PHASE II REPORT

CAZENOVIA CREEK, NEW YORK

1. The plans for Reach 3 in the West Seneca area provide structural protection against discharges expected to occur once in 200 years. However, the interior drainage facilities are designed for a frequency of once in 50 years with low stages in Cazenovia Creek and once in 25 years with concurrent high stages in Cazenovia Creek. This combination of frequencies may result in significant damages from interior drainage in intensely developed residential and commercial areas of the Town of West Seneca. Additional investigation should be conducted to determine the feasibility of a higher degree of protection from interior drainage damages.

2. The estimated annual maintenance costs for structural facilities are much too low based upon more than thirty years of experience in New York State. For example, the report shows estimates of $7,630 for Alternate 2, Reach 3, or 0.225% of estimated project construction costs. We estimate actual annual maintenance costs for this alternate to be $40,000 or 1.18% of construction costs. This is consistent with our experience which indicates annual maintenance by force account to cost between 1% and 2% of construction cost.

3. Serious consideration should be given to construction of a low flow channel in the relocated and improved section in Reach 3. This would reduce the maintenance effort required and would have additional benefits in terms of water quality and temperatures. Pools and riffles in such a channel might also be constructed as a fisheries enhancement measure.

4. Land costs in urban areas should be determined with considerable accuracy to reflect the true cost comparison between levees and floodwalls. This is particularly pertinent in that area of Reach 3 upstream of Union Road. On-site inspection of the area between Willowdale Drive and the right bank of Cazenovia Creek indicates that there appears to be insufficient space for construction of a levee without removal of some houses and relocation of their occupants. These costs, along with the higher ongoing costs of levee maintenance, may be sufficient to economically justify a section of floodwall where space is limited.

5. Levee alignment should allow a minimum of 15 feet from the toe of the levee to the top of existing or improved streambank to allow passage of maintenance equipment.

6. Access ramps should be provided to improved channel no more than 2,000 feet apart.

7. Levees and channel slopes which are to be seeded should be constructed with side slopes of 1:3.

8. In urban areas, riprap slope protection should be a minimum of 24" thick. Experience has shown that smaller size stone is readily displaced by vandals increasing maintenance costs and reducing the dependability of the protective works.

9. Slope protection should be provided on both the protected and unprotected sides at all levee-wall interfaces to protect against erosion damage. Also, slope protection should be provided around drainage structures, headwalls, etc., where eddy currents may cause erosion.

Following are specific comments which apply to Appendix 1, Technical Report:

1. Base Maps - The city limits of Buffalo and Lackawanna appear to be in error. Other municipal boundaries should be checked for accuracy.

2. Page B-14 Transportation - The Penn Central Railroad is not mentioned.

3. Plate B-1 Basin Map - The map shows the entire Buffalo River Basin, but is labeled Cazenovia Creek.

4. Plates B-4, 5, 6 Base Maps - The addition of the Aurora Expressway would add clarity to these plates.

5. Page C-9 Notable Storms - This section should contain a discussion of the June 1972 storm.

6. Page C-10 Climatological Data - The date for June 1972 should be completed.

7. Page H-13 Flows for Frequency Analysis - The maximum flow for 1972 was 12,300 cfs on June 23 rather than 6,650 cfs as shown.

Southgate
Plaza INC.
UNION ROAD AT SENECA STREET, WEST SENECA, N. Y. 14224

August 26, 1974

Colonel B. C. Hughes
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

I observed in the local paper that the West Seneca Board went on record favoring the more extensive flood control plan protecting 140 acres.

I believe that they acted properly and in the interest of more of the citizens and taxpayers of this town. The difference in cost between $2.8 to protect 70 acres vs. $3.4 to protect 140 acres is very little for the additional protection.

I feel that with the flood control for the 140 acres, as the land is utilized, more money will be paid in the form of taxes locally, and even the Federal and State should profit from additional taxes.

Having lived in town all of my life, and having constructed thousands of homes, as well as Southgate Shopping Center, I am well familiar with the area involved, and hope that you will expedite construction of the levee from Mill Road to the Ridge Road Bridge.

Very truly yours,

SOUTHGATE PLAZA, INC.

Carl J. Lambein
President

CJL:ag

Southgate Home Owners Association, Inc.

WEST SENECA, NEW YORK, 14224

July 24, 1974

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Sir: Attention, Colonel Bernard C. Hughes

The Southgate Homeowners Association thank you very much for the excellent explanation you gave of the levee plans at the public meeting held on June 21st, 1974.

You have discovered, I am sure, our homeowners association have been in a constant state of turmoil with our town government over the past few years with regard to the Cazenovia Creek problem.

The homeowners feel confident you and the corps will make a decision on the levee plan based on engineering and environment rather than on the selfish gain of a few individuals. We really feel that this is the first time someone is listening to us in the solving of our problem.

We are not selfish-unless you call desire to protect homes that should never have been built-selfish. It is just common sense, something our town officials sorely lack. We are not looking for further dissention with our town officials but we do think they are wrong in wanting to protect seventy acres of open land for future commercial use. The people of Southgate live in this area, not the town officials. As a matter of record, homes along Seneca Street have already been or are in the process of being sold for commercial development.

Alternate #2, on the surface, may look like it protects and benefits most to the average outsider but if one digs deeper, alternate #1 seems to have the most advantages and protection for the people of Southgate.

Right now the seventy acres of farmland is zoned for commercial use (apartment complexes, ice rinks,etc.). If all that land is protected, what chance does it have for use as open space recreation which our town so sorely needs.

We know that levee plan #1 will be the last chance for the seventy acres of farm land to possibly be used for open space recreation. With plan #2 we definitely will be looking at apartments, etc.

Fortunately other people in our country realize that flood plains are not for people to live on and laws regulating flood plain development are becoming a reality. Help us keep our flood plain in Southgate with levee plan #1 and eventually turn that area into a beautiful public park that all our citizens will be proud of.

Finally we are confident in your engineering know-how that the plan you recommend will offer the residents of Southgate the greatest protection with the least disruption of our present beautiful environment.

Very truly yours,

Robert Riley, Pres.
Southgate Homeowners Ass'n.

P.S. If our position in favor of alternative levee plan #1 can be strengthened by petitions from our area homeowners we will be most happy to obtain them.

RR:LCM

New York State Department of Environmental Conservation

James L. Biggane
~~Henry L. Diamond~~
Commissioner

OFFICE OF PROGRAM DEVELOPMENT, PLANNING AND RESEARCH
PROGRAMMING AND ANALYSIS BUREAU

July 16, 1974

Colonel B. C. Hughes, District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

Attached for your information is a copy of a letter to the Town of West Seneca Supervisor requesting a statement of the position of the Town concerning a local protection project on Cazenovia Creek.

We have completed review of the report and met with Town officials. We will forward our comments and a statement of intent following a reply from the Town.

Sincerely,

ELDRED RICH
Assistant Director for
Programming & Analysis

ec
dpw

COUNTY OF ERIE
EDWARD V. REGAN
COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

KENNETH L. REITMEIER, P. E.
Deputy Commissioner — Highways
95 FRANKLIN STREET, BUFFALO, N. Y. 14202 / (716) 846-8369

July 1, 1974

Col. Bernhard Hughes
U.S. Army Corps of
Engineers
1776 Niagara Street
Buffalo, New York 14206

Re: Cazenovia Creek, Flood
Control Measures

Dear Sir:

We attended the recent public hearing held to present the proposed plans to protect the adjacent land to Cazenovia Creek from Mill Road in West Seneca downstream through the City of Buffalo to its confluence with the Buffalo River.

We wish to be on record as being in favor of either alternate plans for the levees. We would also be in favor of the ice retention structure if we were assured that the Leydecker Road, CR #364, structure would not be damaged by the ice build up. We are confident that this will be thoroughly investigated before you make your final decision.

If we can be of any assistance, please call this office.

Very truly yours,

KENNETH L. REITMEIER, P.E.
Deputy Commissioner-Highways

By: S. Jerome Hawkins
S. Jerome Hawkins, P.E.
Senior Civil Engineer

KLR/SJH/kg

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BUFFALO AREA OFFICE
GRANT BUILDING, 560 MAIN STREET, BUFFALO, NEW YORK 14202

REGION II
26 Federal Plaza
New York, New York 10007

June 25, 1974

IN REPLY REFER TO:
2.2PTR

Major Charles T. Myers III
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Myers:

Subject: Plan of Improvement
Cazenovia Creek
Erie County, New York

This office has made a preliminary review of the improvement plan for the above project.

There are no known adverse effects on any of our projects.

If we can be of additional assistance in the future, do not hesitate to contact this office.

Sincerely,

for Frank D. Cerabone
Area Director

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE – EASTERN REGION
585 Stewart Avenue
Garden City, New York 11530

June 25, 1974

Colonel Bernard Hughes
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Dear Colonel Hughes:

We have reviewed your brochures CAZENOVIA CREEK, REVIEW OF POSSIBLE FLOOD CONTROL MEASURES and SUMMARY OF ENVIRONMENTAL CONSIDERATIONS, CAZENOVIA CREEK and would like to call your attention to an apparent oversight of an alternative measure that should be considered routinely for casualty and flood damage reduction.

This alternative is a river forecast and flood warning service. In the analysis of non-structural measures, a forecast and warning service should be treated separately and in combination with flood proofing and flood plain management as a damage reduction alternative. These should also be included as part of the total alternative when structural measures are presented.

If no forecast and warning service exists, the study might include the technical feasibility and economic justification of establishing this type of service.

We bring this to your attention because the publications imply that other potential solutions were eliminated because of lack of economic merit and suitability in meeting the problems and needs of the area. These other potential solutions are not identified specifically.

Sincerely,

Albert S. Kachic

Albert S. Kachic
Regional Hydrologist

New York State Department of Environmental Conservation

James L. Biggane
Commissioner

June 19, 1974

Colonel Bernard C. Hughes, District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

This letter is in reply to your request for a statement of intent to provide assurances of local cooperation for the proposed flood control project on Cazenovia Creek at West Seneca.

We are presently circulating your report to various interested State and local agencies to enable a coordinated reply in behalf of all non-Federal interests. The State's position will be greatly influenced by the comments received from the local benefitting community and must, therefore, consider the views as expressed at the June 21st public meeting, together with subsequent discussion with local officials.

Please remain assured of our intention to provide the necessary agreements of local cooperation at the appropriate time providing that the needs of local and State interests are met.

Sincerely,

Thomas P. Eichler

Thomas P. Eichler
Director, Office of Program Development,
Planning and Research

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
John W. McCormack Post Office and Courthouse
BOSTON, MASSACHUSETTS 02109

JUN 18 1974

District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Dear Sir:

Major Myers' letter of May 16, 1974, requested our comments on your draft Phase II report on water resource development in the Cazenovia Creek Basin, New York. Our comments are submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We understand many alternatives for flood control and allied purposes were studied for the Cazenovia Creek floodplain. Among them were floodplain management, floodproofing, channel modification, channel diversion, upstream reservoirs, and ice retention structures. You have tentatively selected a combination of floodproofing, floodplain management, a levee system with floodwalls and interior drainage facilities, and channel relocation.

In general, your selected plan includes the highly commendable features of floodproofing and floodplain management, and appears to be minimally disruptive to the environment. Two other concerns need to be addressed, however.

We conclude that benefits for enhancement of undeveloped land in the floodplain should not be included in the benefit-cost analysis. This appears to us to be a contradition of the concept of floodplain management, which is one of your recommended measures, and could be construed to be encouraging development in the floodplain.

If at all possible, the channel of Cazenovia Creek in the vicinity of the Southgate Shopping Plaza in West Seneca should be left in its natural state and not filled. Perhaps the proposed levee could be relocated to avoid the stream. In this way normal stream flows could be accommodated by the natural channel, while flood waters could pass through the new channel.

We appreciate the opportunity to comment on your draft report.

Sincerely yours,

Robert H Shields
ACTING Regional Director

STANLEY M. MAKOWSKI
Mayor

Department of Public Works
City of Buffalo, N. Y.

ROOM 502 — CITY HALL — BUFFALO, NEW YORK -- 14202 — PHONE 856-4200 Ext. 301

JAMES [illegible]
Commissioner

June 12, 1974

Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

RE: Phase II Report - Cazenovia Creek

Gentlemen:

This office has reviewed the subject report and wishes to go on record as strongly objecting to the recommendations contained therein.

As stated on page 36 of the main report, "it is evident from a review of past flooding in Cazenovia Creek that the presence of ice in the creek during the spring thaw is a major factor in causing over-bank flooding".

Based on our experience, this office heartily concurs with this statement. However, the report then goes on to recommend Plan #1 which does nothing to reduce the volume of ice flow in the creek and rejects Plan #2 which does limit the volume of ice.

The basis for this is that the benefit/cost ratio for Plan #2 is slightly less than 1. However, may I draw your attention to the following:

1. The B/C ratio calculations are based on many assumptions and are not exact. Therefore, the B/C ratio for Plan #2 could be 1 or higher.

2. Plan #1 does nothing to alleviate the City of Buffalo's flooding problems and in fact might even aggravate them.

Therefore, based on the above this office requests that Plan #1 be rejected and Plan #2 adopted.

Very truly yours,

James J. MacDonald, P.E.
Commissioner of Public Works

cc: Councilman Higgins

JJM:RSS
JCL/blh

Southgate Home Owners Association, Inc.

WEST SENECA, NEW YORK, 14224

June 10, 1974

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Gentlemen: Attention, Major Charles T. Myers 111

A well attended meeting of the Southgate Home Owners Association Inc. at St. David's Church, June 9, 1974, 8:00 P.M., was held for the purpose of discussion regarding the Phase 2 Report, to consider both favorable and negative replies from our membership. The board recommended, after careful study, alternate #1 plan, which brings the levee along Cazenovia Creek to up behind Parkside Drive, leaving a much needed flood plain suitable for recreation.

Fortunately, all but one couple were in favor of alternate #1 plan for improvement. This couple was not in favor of alternate #1 or #2.

We hope you will take action on alternate #1 and move with all expediency.

Our organization thanks you very much for a most interesting and comprehensive report, and looks forward to the public meeting on Friday, June 21, at West Seneca West Senior High School.

Very truly yours,

Robert W. Riley

Robert W. Riley, Pres.

RWR:LCM

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
NORTHEAST REGIONAL OFFICE
Federal Building - Room 9310
600 ARCH STREET
Philadelphia, Pennsylvania 19106

IN REPLY REFER TO:

JUN 7 1974

Major Charles T. Myers, III
Acting District Engineer
Buffalo District, Corps of Engineers
1776 Niagra Street
Buffalo, NY 14207

Dear Major Myers:

We received a copy of the draft Phase II report on Cazenovia Creek, NY, which was forwarded to our office for review and comments. While we recognize the importance of the project, we regret that we have not been able to perform a detailed review due to commitments of staff and funds to other ongoing activities.

We have noted that the plan alternative selected for recommendation favors nonstructural measures including flood plain management and flood proofing as being the least costly, socially and environmentally, and most economically beneficial. We also were pleased to note that a program to utilize the recreational potential of Cazenovia Creek was recommended. Presumably, because we are not familiar with the region, the areas described in the report will complement the flood damage objectives of the plan proposed, while providing a green belt to act as a barrier against further flood plain enchroachment.

We appreciate being provided an opportunity to comment on the proposal for Cazenovia Creek.

Sincerely yours,

Earl C. Nichols
Assistant Regional Director
Resource Planning Services

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
ROCHESTER FIELD OFFICE
P.O. BOX 5036
ROCHESTER, NEW YORK 14627

June 5, 1974

Colonel Bernard C. Hughes
District Engineer
Buffalo District
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Dear Colonel Hughes:

We have completed a review of the draft Phase II report (Main Report and Appendix 1) for the Cazenovia Creek Basin, New York. From the information presented, we agree that the selected plan best meets the water and land resource needs of the area while providing a minimum of environmental impairment.

Thank you for the opportunity to comment at this time. We would also appreciate seeing a copy of Appendix 2 when available.

Sincerely yours,

R.L. Flint Jr

R. L. Flint, Jr.
Chief, Program Support Section

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

JUN 4 1974

Major Charles T. Myers III
Acting District Engineer
Buffalo District, Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Major Myers:

We have received your request for comments on the draft Phase II Water Resources Development report on the Cazenovia Creek Basin, New York.

Based on the Main Report and the Technical Report, Appendix I, we have the following comments.

1. We commend the fact that non-structural methods of flood control, as flood proofing and flood plain management techniques, are the recommended measures for the major part of the project. This plan reinforces the concept of a flood plain, to provide space sufficient to pass floodwaters with minimum damage to manmade facilities.

2. Care would have to be taken to limit construction outside of the floodway and flood fringe so as not to increase excessively the runoff from the developed area. This would reduce the volume of water necessary to precipitate a flood. This is a segment of good flood plain management.

3. Reach 3 is that portion of Cazenovia Creek for which structural flood control measures are proposed. Alternative 1 appears to be more desirable than Alternative 2 in that the land by the river is maintained as floodway, with protection against encroachment by developers. In Alternative 2, the levee would open the land for development and so increase runoff and the threat of flooding. Floodproofing is the more environmentally sound measure, in that the area would be unaltered and able to serve as a flood plain. It is also a more economical measure. However, the report declares this is against the wishes of the local citizenry, because the alternative would not relieve the disruption of services that would occur. Some vegetation would require removal in order to implement the recommended

alternative. Is it possible to employ this in landscaping after construction is complete?

We hope these comments are of assistance to you in the preparation of your report.

Sincerely yours,

Charles N Durfor

Charles Durfor
Chief
Water Branch

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
700 East Water Street, Syracuse, New York 13210

June 4, 1974

Major Charles T. Myers, III
Acting District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Myers:

We have reviewed the Cazenovia Creek Basin, New York Water Resources Development Main Report and Appendix 1 Technical Report.

Our comments are listed below:

A. Main Report

1. Page 4 - 2nd paragraph

This paragraph which discusses House Document No. 574, 78th Congress, could be expanded to include a little more information on this prior work.

Under the Flood Control Act of 1944, the SCS was authorized to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (including Cazenovia Creek).

The major purpose of the Buffalo Creek Watershed Project was to reduce sediment in Buffalo Harbor. Streambanks were the primary source of sediment although agricultural farmland erosion and soil erosion from the construction site also contributed sediment.

The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, led the way in promoting this flood prevention project. Among its other activities, this group secured all the needed land rights and also is presently performing the needed maintenance measures.

The sponsors, with SCS assistance, made full use of the authorities, provided stream stabilization and improvement measures, along with a program of land treatment work.

The attached memo, dated March 13, 1972, sent to the appropriate Congressmen, briefly summarizing the Buffalo Creek Project, will give you further information.

2. Page 29-30 - Possible Solutions

Under Structural Measures, you may want to add item f. Continued or Accelerated Land Treatment Programs in the Watershed of Cazenovia Creek by the Erie and Wyoming County Soil and Water Conservation Districts. Although the Flood Peak Reductions will be small, the decrease in sedimentation within the Brook can significantly lessen maintenance cost.

3. Plate 5

We note in the legend that the unshaded symbol indicates agricultural or vacant land. The vacant land does not seem like an appropriate term. Should this be idle land? Or open space?

B. Appendix 1

1. Page A-5 - Prior Studies and Reports

Comments same as for A.1. Main Report.

2. Page D-5 - Possible Solutions

Comments same as for A.2. Main Report

3. Section E

It may be that the selected plan should include a recommendation on a program of accelerated land treatment in this watershed.

4. Plate H-2 titled "Soils Profile"

   This plate may be more appropriately titled Soil Survey Map. A number of different numbers are included on the delineations although the key to these numbers is not conveniently found.

We appreciate the opportunity to comment on these reports.

Sincerely yours,

Robert L. Hilliard
State Conservationist

Attachment
cc: Eugene C. Hanchett, AC, SCS, Batavia, New York

700 East Water Street, Syracuse, New York 13210

March 13, 197[illegible]

Honorable Barber B. Conable, Jr.
Member, House of Representatives
230 Cannon House Office Building
Washington, D. C. 20515

Dear Mr. Conable:

I note with interest your proposed Bill HR-12192 to authorize a program for the improvement and restoration of the Buffalo River Basin in New York.

During the period between 1944 and 1964, SCS assisted local sponsors in this basin, in carrying out a program of watershed protection and flood prevention.

With your high interest in this watershed, I thought you might be interested in a brief resume on this work.

As you probably know, under the Flood Control Act of 1944, the SCS was authorized to assist local sponsors in applying flood control and land treatment measures on this watershed.

The major purpose of the Buffalo Creek Watershed project was to reduce the sediment in Buffalo Harbor. Streambanks were the primary source of sediment although agricultural farmland erosion and soil erosion from construction sites also contributed sediment.

The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, led the way in promoting the Flood Prevention Project. Among its other activities, this group secured all the needed land rights and also is presently performing the needed maintenance measure at an annual cost of about $7,000.

The drainage area of the watershed covers 279,680 acres in Erie and Wyoming Counties including 13,440 acres within the city of Buffalo.

Studies of the watershed showed that a major portion (70%) of the damage in the watershed were caused by sediment ($242,000 annually - 1955 price base). Other damages resulted from erosion ($67,000 annually) and inundation ($37,000 annually).

Detailed surveys of the watershed showed that there were two primary sources for the sediment entering Buffalo Harbor, these being sheet erosion from the land and streambank erosion.

The planning group determined that a reduction of a portion of these damages was economically feasible. The reduction in damages attributable to land treatment was 47% and that attributable to stream stabilization was 53%.

Under the planned program, 57 miles of channel stabilization was done including riprap, dikes, sloping and vegetative measures. The land treatment phases included a variety of soil and water conservation practices in the upland areas. Of the 4,000 landowners in the watershed, nearly 1,000 became soil conservation district cooperators and helped in carrying out the land treatment work.

The total cost of all the work was $4,600,000.

The Agricultural Research Service monitored the river from 1944 to 1953. These monitoring studies found that before the project 261,000 cubic yards of sediment were annually being dredged from Buffalo Harbor and its entrance.

By 1957, with approximately 75% of the project work completed, there was a reduction in the sediment dredged equal to 46%.

SCS and the sponsers made full use of the authorities provided by Congress in this watershed. Local groups realize that there are other needed measures in the watershed as brought out in your proposed bill.

There is a continuing need to maintain the stream stabilization work and it may now be feasible to do additional work in selected areas.

The changing land use and the rapid development of certain areas of the watershed require added land treatment works and assistance.

The Erie and Wyoming Soil and Water Conservation Districts' Program, with SCS assistance, is oriented toward trying to keep abreast of these needs.

In concluding, I would like you to know that SCS has on hand for anyone's use a good deal of technical data that might be helpful to the Corps of Engineers of any other agency that might undertake further work in this watershed. Further, if you haven't already had a first hand look at the work mentioned above, it might be of interest and value to do so if you could fit it into your busy schedule this year.

Sincerely yours,

A. C. Addison
State Conservationist

Same letter sent to:

Honorable Jack F. Kemp	Honorable Thaddeus J. Dulski
Member, House of Representatives	Member, House of Representatives
1229 Longworth House Office Building	205 Cannon House Office Building
Washington, D. C. 20515	Washington, D. C. 20515

HSS/ACAddison/rc

bcc: Robert E. Francis, AC, SCS, Batavia, New York
Charles R. Barnett, Jr., DC, SCS, East Aurora, New York (Erie)
Robert Q. Smith, DC, SCS, Warsaw, New York (Wyoming)

TOWN OF AURORA

5 SOUTH GROVE STREET
EAST AURORA, NEW YORK 14052

December 13, 1973

U. S. Army
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Gentlemen:

As conveyed by telephone to your planner, Mr. Kelly, it was not possible for the Aurora Town Board or Town of Aurora Planning Board to be present at your Cazenovia Creek public meeting Tuesday December 11, 1973.

Mr. Kelly informed me that if anything were submitted subsequent to the meeting, in writing, it would be made a part of the record.

Accordingly I enclose copy of statement on behalf of the Aurora Town Board made at a public hearing held by the Erie-Niagara Basin Regional Water Resources Board, and copy of statement made to the Erie-Niagara Regional Planning Board.

The position of the Aurora Town Board remains unchanged, specifically it is opposed to damming of Cazenovia Creek with resultant flooding of lands and destruction of gorge and flood plains now constituting a portion of this Town's designated conservation open space area.

Very truly yours,

Abbott B. Henshaw

Abbott B. Henshaw
Supervisor

ABH:re

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12201

JAMES L. BIGGAN
~~Henry L. Diamond~~
Commissioner

OFFICE OF PROGRAM DEVELOPMENT, PLANNING AND RESEARCH
PROGRAMMING AND ANALYSIS BUREAU

May 23, 1974

Major Charles T. Myers III
Acting District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

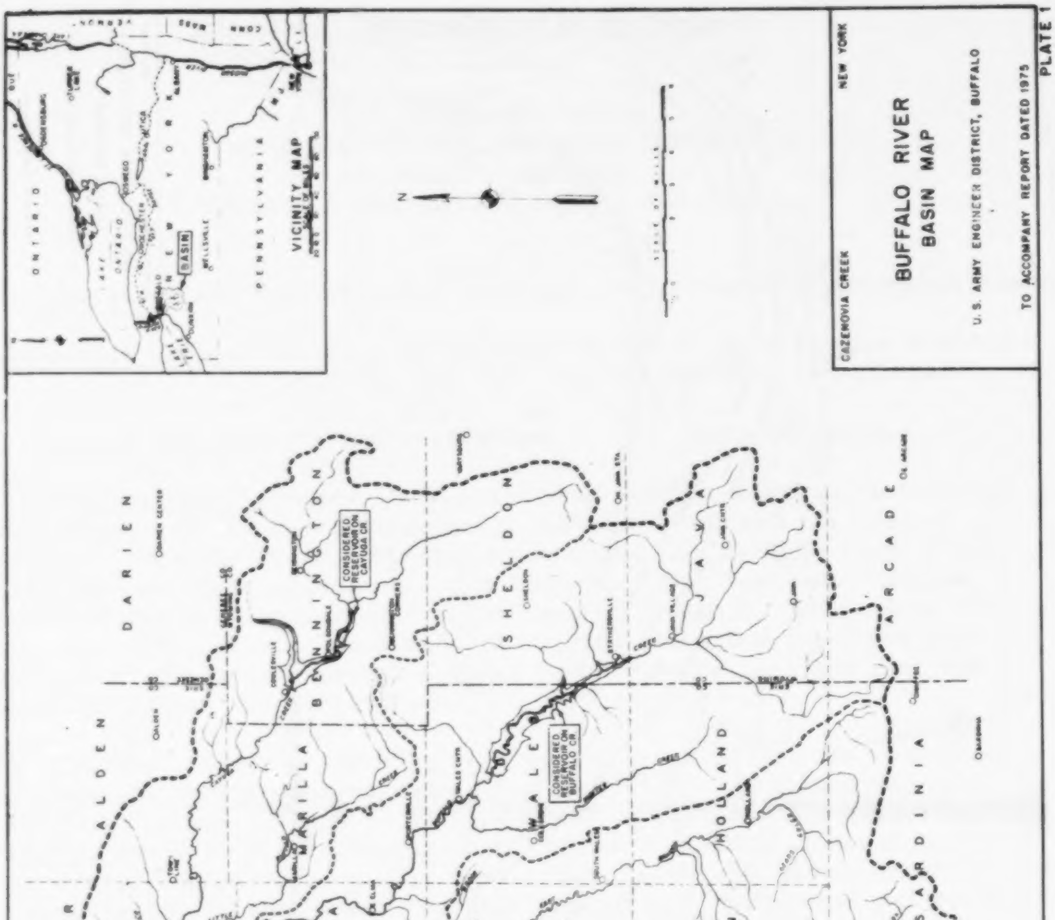
Dear Mayor Myers:

Receipt is acknowledged of your letter of May 16, 1974, transmitting the draft Phase II report on Cazenovia Creek, New York. It will not be possible to review and forward coordinated comments from this Department by June 10, 1974. However, such comments will be sent as soon as possible.

Sincerely,

ELDRED RICH
Assistant Director for
Programming & Analysis

RLK/ea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CITY OF BUFFALO
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SHELDON
JAVA
ARCADE
SARDINIA
CONCORD
BOSTON
COLDEN
HOLLAND
WALES
MARILLA
ELMA
AURORA
EAST AURORA
WEST SENECA
ORCHARD PARK
HAMBURG
CITY OF LACKAWANNA
CONSIDERED RESERVOIR ON CAYUGA CR
CONSIDERED RESERVOIR ON BUFFALO CR
CONSIDERED RESERVOIR ON CAZENOVIA CR
RECOMMENDED ICE RETENTION STRUCTURE
CONSIDERED PROTECTION
N
SCALE OF MILES
VICINITY MAP
ONTARIO
NEW YORK
PENNSYLVANIA
BASIN

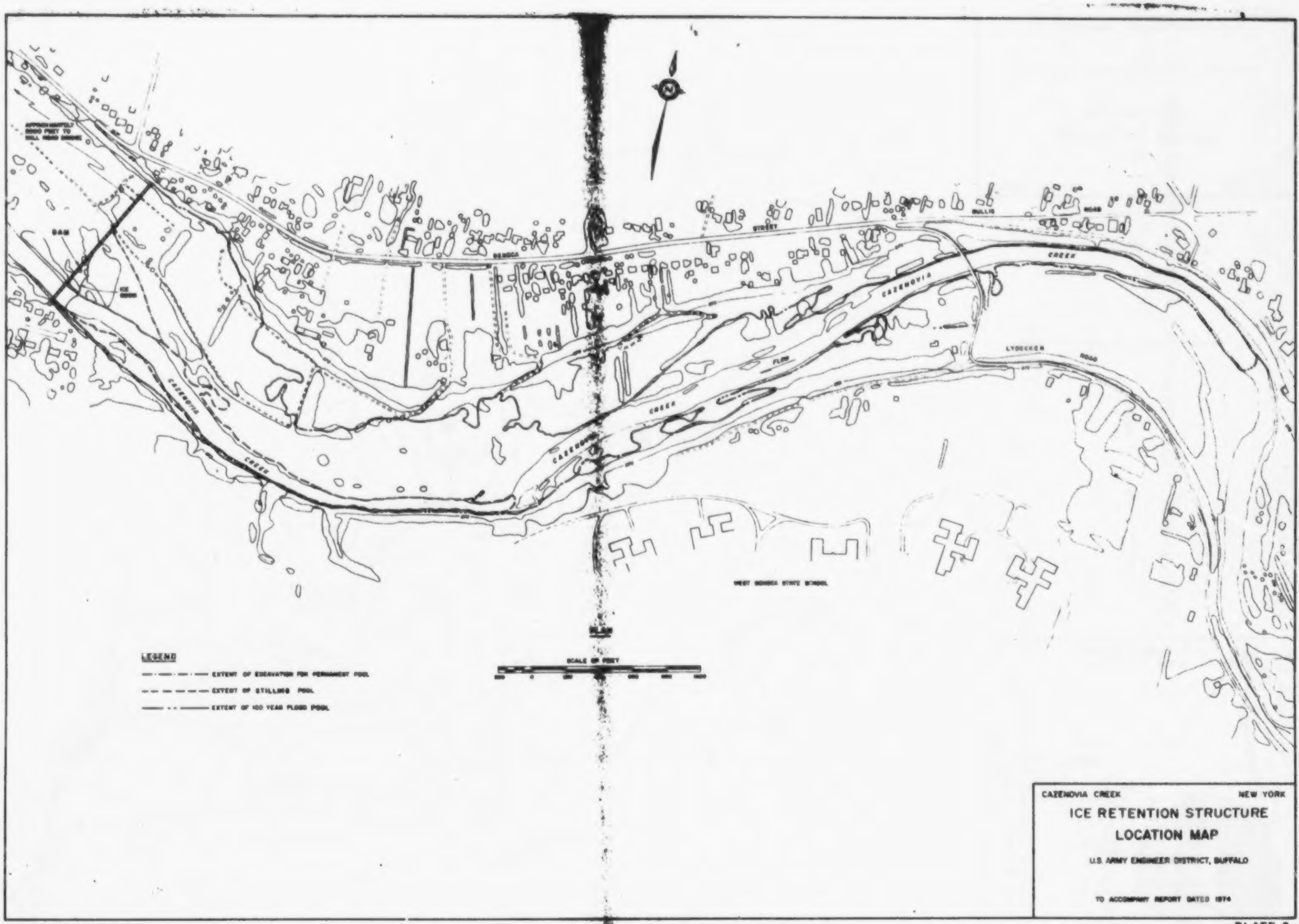
CAZENOVIA CREEK NEW YORK

BUFFALO RIVER
BASIN MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1975

PLATE 1


DAM
ICE BOOM
SENECA STREET
BULLIS ROAD
CAZENOVIA CREEK
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CAZENOVIA CREEK
FLOW
LYDECKER ROAD
WEST SENECA STATE SCHOOL
PLAN
SCALE OF FEET
LEGEND
EXTENT OF EXCAVATION FOR PERMANENT POOL
EXTENT OF STILLING POOL
EXTENT OF 100 YEAR FLOOD POOL

CAZENOVIA CREEK NEW YORK

ICE RETENTION STRUCTURE

LOCATION MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE 9

FINAL ENVIRONMENTAL STATEMENT

SUMMARY
FEASIBILITY STUDY FOR FLOOD CONTROL AND RELATED PURPOSES
CAZENOVIA CREEK, ERIE COUNTY, NEW YORK

( ) Revised Draft Environmental Statement (X) Final Environmental Statement

Responsible Office: U. S. Army Engineer District, 1776 Niagara Street,
Buffalo, New York 14207 PH# A.C. 716-876-5454

1. Name of Action: ( ) Administrative (X) Legislative

2. Description of Action: Both structural and non-structural features are proposed in the feasibility study for flood control and related purposes on Cazenovia Creek. Non-structural measures include flood plain management and participation in the National Flood Insurance Program. Such measures are recommended for Reaches 1 through 3, areas along the main stem of Cazenovia Creek between the ice retention structure and confluence of east and west branches, Tannery Brook, and the east and west branches of Cazenovia Creek.

The structural flood protection measure would include an ice retention structure in West Seneca to reduce ice-affected flood stages in the following reaches: Reach 1, Buffalo River to the New York State Thruway; Reach 2, New York State Thruway to the Ridge Road Bridge; Reach 3, Ridge Road Bridge to upstream of Mill Road. The ice retention dam structure would be constructed approximately one mile upstream of Union Road and would consist of a concrete dam and spillway forming an 11-acre pool with a maximum depth of approximately 10 feet. The structure would rest on bedrock and the ends of the dam would be tied into high ground by means of wingwall abutments with top elevation about 30 feet above the creek bed level. A floating ice boom would be anchored in several places upstream of the dam to obstruct downstream movement of ice during periods of thaw or high flow. The pool would serve to pond water flowing into it, thereby promoting formation of an ice cover during the winter to prevent ice flows from moving downstream into Reaches 1, 2, and 3 during ice breakup periods. Three gated 36-inch diameter conduits would be placed at the bottom of the spillway to permit drainage of the pool during that period of the year that the ice retention structure is needed.

3. a. Environmental Impacts: Flood plain management provisions of the project would serve to help perpetuate the natural state of Cazenovia Creek and the primary floodway, and would provide a means of controlling flood plain encroachment. Non-structural flood control measures would contribute toward lessening the potential impact of future flooding.

The proposed ice retaining structure would reduce the potential threat of flooding in Reaches 1 through 3 in Buffalo and West Seneca. Based on October 1972 levels of development and October 1974 price levels, the ice retention structure would reduce average annual damages along Cazenovia Creek from $228,700 to $75,300. There would be very little flood damage reduction in Subreach 1A. Installation of the proposed ice retaining structure would: a. reduce the one percent probability flood stages in Subreaches 1B and 2A by approximately three feet; b. not significantly decrease flood levels and average annual damages in Subreach 2B; c. reduce flood levels somewhat in Subreach 3A; d. reduce flood stages over five feet for a one percent probability flood discharge in Subreach 3B; e. reduce the chance of water level reaching the Southgate Plaza parking area in Subreach 3C, or the houses upstream of Union Road, from 40 percent to four percent on an annual basis.

The birthplace of Millard Fillmore, 13th president of the United States (1850-53), is located in East Aurora. This site has recently been included in the National Register of Historic Places. No other National Register properties or Historic Landmark sites either included or eligible for inclusion in the National Register are known to exist in the Cazenovia basin. To verify this observation, comments have been requested from the New York State Office of Parks and Recreation and the U. S. Department of the Interior. Letters requesting comments from these agencies are included in Appendix B, entitled "Letters of Coordination".

Although the proposed plan involves pool draining for long periods of time annually, should local interests decide to maintain a somewhat lentic pool (slow moving), it is possible that the pool may provide a habitat for aquatic organisms.

It is anticipated that no existing industrial or commercial activity and public service would be disrupted. No homes or farmsteads would require relocation and no existing industrial or commercial activity and public service would be disrupted. Only one man-made structure - an abandoned warehouse - would be relocated. Inundation rights would have to be obtained for about 20 acres of potential agricultural land but there would be no significant loss of tax revenues.

b. Adverse Environmental Impacts: Temporary impacts such as noise, dust and water turbidity would occur during construction. However, the Contractor performing the work would be required to minimize these effects by following procedures and regulations outlined in the Civil Works Construction Guide Specification for Environmental Protection (CE-1300, May 1970).

The following approximate acreage area would be disrupted by construction activity or periodic flooding:

1 acre --- Dam Site
5 acres --- Excavated for the stilling pool
20 acres --- Subject to periodic flooding
10 acres --- Cleared, grubbed and restored by grading and planting
36 acres TOTAL

Estimated acreage subject to potential ice scour above the dam includes:

5 acres --- Excavated for the stilling basin
10 acres --- Cleared, grubbed and restored by grading and planting
50 acres --- Additional area east of the dam
65 acres TOTAL

When flooded, the stilling pool would occupy about 11 acres total - this includes the aforementioned 5 acre area that would be excavated and 6 acres of natural creek channel.

The ice retention structure would have some probable impact upon streamlife and water quality in Cazenovia Creek. Siltation due to construction would cover some benthic organisms downstream and may even disrupt spawning beds. Annual drainage of the ice retention pool would also destroy benthic organisms that have established in the pool sediment. If the pool should stratify and its lower waters stagnate, drainage of the pool may release stagnated water into Cazenovia Creek downstream. However, it is anticipated that the pool would probably stagnate only under relatively extreme conditions as indicated in paragraph 4.11 of this statement.

4. Alternatives: Alternatives to the proposed action are as follows:

Alternative 1 - Local Protection in Reach 3 and Flood Plain Management.
Alternative 2 - Floodproofing in Reach 3 and Flood Plain Management.
Alternative 3 - Ice Retention Structure and Flood Plain Management.
Alternative 4 - No Action.

5. a. Comments Received: (District Review): The following agencies and organizations responded to requests for comments on the Draft Environmental Impact Statement:

U. S. Department of Transportation	10 December 1974
U. S. Department of the Interior:	
(1) Bureau of Outdoor Recreation	9 January 1975
(2) Bureau of Mines	13 January 1975
(3) National Park Service	16 January 1975
(4) Fish and Wildlife Service	7 March 1975
U. S. Department of Agriculture - Soil Conservation Service	6 January 1975
U. S. Environmental Protection Agency - Region II	27 January 1975
New York State Parks and Recreation	10 March 1975
New York State Department of Health	9 December 1974
New York Archaeological Council	6 February 1975
The State Education Department:	
New York State Museum and Science Service	18 February 1975
New York State Department of Environmental Conservation	20 February 1975

b. Comments Received: (Departmental Review): The following agencies responded to requests for comments on the Revised Draft Environmental Statement:

U. S. Department of Housing and Urban Development	14 September 1976
U. S. Environmental Protection Agency	1 October 1976
U. S. Department of Health, Education and Welfare	6 October 1976
U. S. Department of Agriculture - Soil Conservation Service	29 October 1976
U. S. Department of Interior	5 November 1976
U. S. Department of Transportation	11 November 1976
N. Y. S. Department of Environmental Conservation	13 January 1977

6. Draft Statement to CEQ 3 December 1974 .

Revised Draft Statement to CEQ 20 August 1976.

Final Statement to EPA ____________________.

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INTRODUCTION

The Draft Environmental Statement (EIS) on Water Resource Development in the Cazenovia Creek basin has been prepared by the Buffalo District, Corps of Engineers consonant in accordance with the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190. Two primary objectives are sought in the development of this document. First, in carrying out the processes and studies involved in preparing a suitable EIS, an agency is required to carefully identify and evaluate the effects of a proposed project on the total human environment. The EIS is, in fact, a detailed chronological documentation of these processes and studies. Secondly, the EIS provides for broad Federal, State and public review of the details of the proposed project and the impacts, both favorable and unfavorabe, which the project will have on the existing environment. Regulations provide that a 45-day review period will follow issuance of a draft EIS, during which time any interested agency, organization or party may submit comments in writing to the issuing agency on the proposed project or the draft EIS. The issuing agency is then required to specifically address each comment and issue a final EIS, which, after its approval, is submitted to the President's Council on Environmental Quality (CEQ). It then becomes an instrument, organic to the planning process, which delineates environmental "benefits" and "costs" much as the project survey report delineates economic benefits and costs. Therefore, it is imperative that the preparing agency put forth a maximum effort in developing an accurate, complete and objective EIS and that reviewing bodies submit cogent and relevant comments.

The draft environmental statement and this revised draft environmental statement contains nine sections. Section 1 is a description of the proposed project. At this point in the project development process, final engineering designs and specifications are not available, thus many specific project features can be described in only general terms. The description is, however, as complete and current as possible.

Section 2 describes in detail the present environmental setting in the project area--not only in the immediate zone of construction, but also in more distant surrounding areas which may be indirectly affected by the proposed project. Section 3 describes the effect of the proposed action on land use plans in the project area.

The information developed in the first three sections sets the stage for an analysis and prediction of the effects of the proposed project superimposed upon the baseline conditions (Section 4). Not all changes will be favorable; nevertheless, should a project not deliver some substantive benefits, its justification would be tenuous. Many adverse effects of most projects can be mitigated or eliminated to an extent by innovative planning or engineering techniques. However, many other impacts are absolute and not subject to such mitigation and, as such, stand as adverse and unavoidable. These impacts are identified in Section 5.

A large number of feasible alternative solutions may exist to any problem. It is the responsibility of a planning agency, such as the Corps of Engineers, to identify and carefully study each possible alternative from an engineering, economic and environmental perspective in order that the most desirable, cost-effective and environmentally sound alternative is selected. Section 6 describes each considered alternative and discusses its costs, feasibility and environmental impacts. Sections 7 and 8 deal with the questions of long-term impacts of the proposed project on productivity, social well-being and commitments of natural resources.

Interagency coordination and public meetings and workshops are held on every Corps project. So that reviewers of the EIS are aware of the depth and extent of the Corps outside involvement in the Cazenovia Creek Project, a summary of these events is outlined in Section 9.

Letters of comment received on the draft environmental statement are included in Appendix A of this revised draft environmental statement; responses to all written comments received follow paragraph 9.09 in Section 9.

SECTION 1

1. PROJECT DESCRIPTION

1.01 This section describes in detail the plan proposed to meet flood management needs in the Cazenovia Creek Basin. The description includes physical features, effects of the plan, and significant design and construction information. Project benefits and costs, given in Appendix C, have been updated to reflect October 1974 price levels. Plate 1 is a map of Cazenovia Creek Basin. Plate 2 delineates damage reaches along Cazenovia Creek. Plates 3 and 4 depict the plan of structural improvements recommended in the proposed plan.

1.02 The feasibility study of Cazenovia Creek was undertaken in response to: resolutions by the Committee on Public Works of the House of Representatives adopted 13 June 1965; resolution by the Committee on Public Works of the United States Senate, adopted 10 July 1961; and resolution of the House Committee on Public Works adopted on 14 June 1972.

1.03 The proposed plan is described in detail below. The key feature of the plan is the construction of an ice retention dam on Cazenovia Creek in West Seneca. No additional structural measures are considered necessary. Note that the degree of protection provided varies throughout the damage reaches. See Section 6 for a discussion of considered flood management alternatives.

1.04 The proposed plan of action is as follows:

Reach	Plan of Action	Degree of Protection
1-Buffalo River to NY State Thruway	Recommend floodplain management and flood insurance. Ice retention structure will provide some benefit by reducing ice-affected flood stages.	1A 30 yr. 1B 55 yr.
2-NY State Thruway to Ridge Road Bridge	Flood insurance and floodplain management recommended in this reach. Ice retention structure will reduce the ice-affected flood stages in Reach 2A, providing some benefit.	2A 10 yr. 2B 2 yr.
3-Ridge Road Bridge to upstream of Mill Road	Ice retention structure will provide substantial benefits by reducing ice-affected flood stages. Floodplain management and participation in flood insurance program recommended in this reach.	3A 60 yr. 3B 125 yr. 3C 25 yr.

Reach	Plan of Action	Degree of Protection
Main stem of Cazenovia Creek between ice retaining structure and confluence of East and West Branches; West Branch; East Branch.	Floodplain Management and flood insurance are recommended.	No protection
Tannery Brook	No structural measure was found to be economically feasible along Tannery Brook. Floodplain management and flood insurance are recommended. Individual homeowners may find it desirable to floodproof their residences.	No protection

1.05 Non-structural Features

1.06 Participation in the National Flood Insurance Program is the recommended non-structural feature of the selected plan. The U. S. Department of Housing and Urban Development (H.U.D.), the administering agency for this program, has issued preliminary maps showing flood hazard areas for every township in the Cazenovia Creek Basin plus the City of Buffalo and the Village of East Aurora, indicating the overall basinwide need for effective floodplain management of all areas bordering the creek and its major tributary, Tannery Brook.

1.07 To participate in the National Flood Insurance Program, a local government must adopt sound floodplain management regulations meeting H.U.D. approval. The procedure generally followed by local governments to qualify for the program is discussed below.

1.08 Generally, a local government is made aware of its need for participation in the program when H.U.D. issues a preliminary map identifying special flood hazard areas. Existing developments within these flood hazard areas are required to have flood insurance before they are able to get financial aid (mortgages, improvement loans, etc.) from Federally insured, regulated, or subsidized institutions. To qualify the area for flood insurance, the local government must apply to H.U.D. for eligibility to the temporary emergency program providing flood insurance to existing developments at subsidized rates. The application must include tentative floodplain management regulations. A Type 15 flood insurance study is then conducted by the Corps of Engineers or other qualified agency using detailed hydrologic and hydraulic studies to determine the 100-year floodplain and to zone the area according to the relative flooding risk. The results are submitted to H.U.D. which then issues a rate map based on the flood risk zones and specifying acturial flood insurance rates for future developments. To qualify for the regular flood insurance program before expiration of the emergency program, the local government must then revise its floodplain management regulations in accordance with the refined floodplain outline and minimun Federal requirements as set forth in Section 1910 of the National Flood Insurance Program Regulations.

1.09 Table 1 indicates what phases of this process have been completed for each of the major local governments in the Cazenovia Creek Basin. H.U.D. has issued preliminary flood hazard area maps for each of the areas listed, thereby covering the entire basin. However, only four, the City of Buffalo, the Village of East Aurora, and the Towns of West Seneca and Elma have been declared eligible for emergency flood insurance coverage, indicating that the remaining communities have not as yet adopted preliminary floodplain management regulations and/or submitted applications to H.U.D. Three communities have had the Type 15 flood insurance studies completed for then, the Village of East Aurora and the Towns of West Seneca and Elma, but only East Aurora has had a rate map issued by H.U.D. to date. East Aurora has submitted revised floodplain management regulations and has qualified for participation in the regular flood insurance program.

Table 1

Flood Insurance Status for Communities in Cazenovia Creek Basin*

	Phase Completed				
Community	Preliminary Flood Hazard Area Maps	Declared Eligible for Emergency Coverage	Completion of Type 15 Study	H.U.D. Issued Rate Map	Declared Eligible for Regular Program
City of Buffalo	X	X			
Village of East Aurora	X	X	X	X	X
Town of West Seneca	X	X	X		
Town of Elma	X	X	X		
Town of Aurora	X				
Town of Boston	X				
Town of Colden	X				

Table 1 (cont'd)

Flood Insurance Status for Communities in Cazenovia Creek Basin*

Community	Phase Completed				
	Preliminary Flood Hazard Area Maps	Declared Eligible for Emergency Coverage	Completion of Type 15 Study	H.U.D. Issued: Rate Map	Declared Eligible for Regular Program
Town of Concord	X				
Town of Sardinia	X				
Town of Holland	X				
Town of Orchard Park	X				
Town of Wales	X				

*As of 30 November 1974

1.10 Structural Features

1.11 The structural flood protection measure recommended for Cazenovia Creek is an ice retention structure to be constructed approximately one mile upstream of Union Road. A low-level dam across the creek would provide significant flood protection to floodprone areas downstream by creating a pond which would allow a stable ice cover to form behind the structure and hold back ice coming downstream during periods of ice breakup. Thus, the high water levels due to ice jamming would be eliminated and the degree of protection in the lower portion of the basin would be increased.

1.12 Since some ice will form below the structure and could flow downstream causing minor ice jamming in Reaches 1 and 2, these reaches may derive less direct benefit from the proposed structural works than Reach 3. Furthermore, the ice retention structure would not provide sufficient water storage capacity to reduce peak free flow and consequently does not provide protection against free flow high water levels. Throughout the major damage areas near Union Road Bridge, the ice-free stage for a given flow is significantly less (3 to 5 feet) than ice-affected stages.

1.13 The effect of the ice retention structure is to reduce the average annual damages along Cazenovia Creek from $153,500 to $4,000 except for Subreach 1A in which flood water from the Buffalo River is the major cause of flood damage water levels and Tannery Brook.

1.14 The locations and general design of the ice retention structure is shown on Plate 3. The structure would span the creek and adjacent valley with an overall length of approximately 900 feet. The structure itself would be a two-part system consisting of a lower and upper weir.

1.15 The lower weir, approximately 250 feet long (Plate 4), would have a crest elevation of 639 feet and maximum height of 9 feet above the creek thalweg. During late winter and early spring an 11 acre pool would be formed behind the structure and flow passing over the crest of the lower weir. The lower weir is designed to pass the 100-year discharge of 16,800 cfs. A discharge coefficient of 2.95 was used in designing the length of the lower weir and elevation of the upper weir. A stilling basin would be located at the base of the lower weir to reduce velocities during flood conditions. The stilling basin would span the creekbed and extend approximately 100 feet downstream from the structure.

1.16 An ice boom, shown on Plate 4 would be placed upstream of the structure to control ice flowing down the creek. The boom would hold the ice behind it allowing a stable cover to form on the pond. The winter stream flow would pass under the stable cover and discharge over the lower weir. During the ice breakup periods, the boom would hold the ice back to melt in place behind the ice retention structure during the spring thaw.

1.17 The upper weir (Plate 4) would have a crest elevation of 647 feet and width of approximately 3 feet. This section of the ice retention structure (approximately 665 feet long) would extend from the right end of the lower weir to the high ground along Seneca Street. The structure is designed to allow the Standard Project Flood (77,000 cfs) to pass over the ice retention structure without overtopping the abutments. Both ends of the ice retention structure would be tied into the high ground by means of wing walls. A discharge coefficient of 3.95 was used to design the top elevation of the wing walls on either end of the ice retention structure. Each wall would have a top elevation of 660 feet allowing 3 feet of freeboard above the Standard Project Flood level.

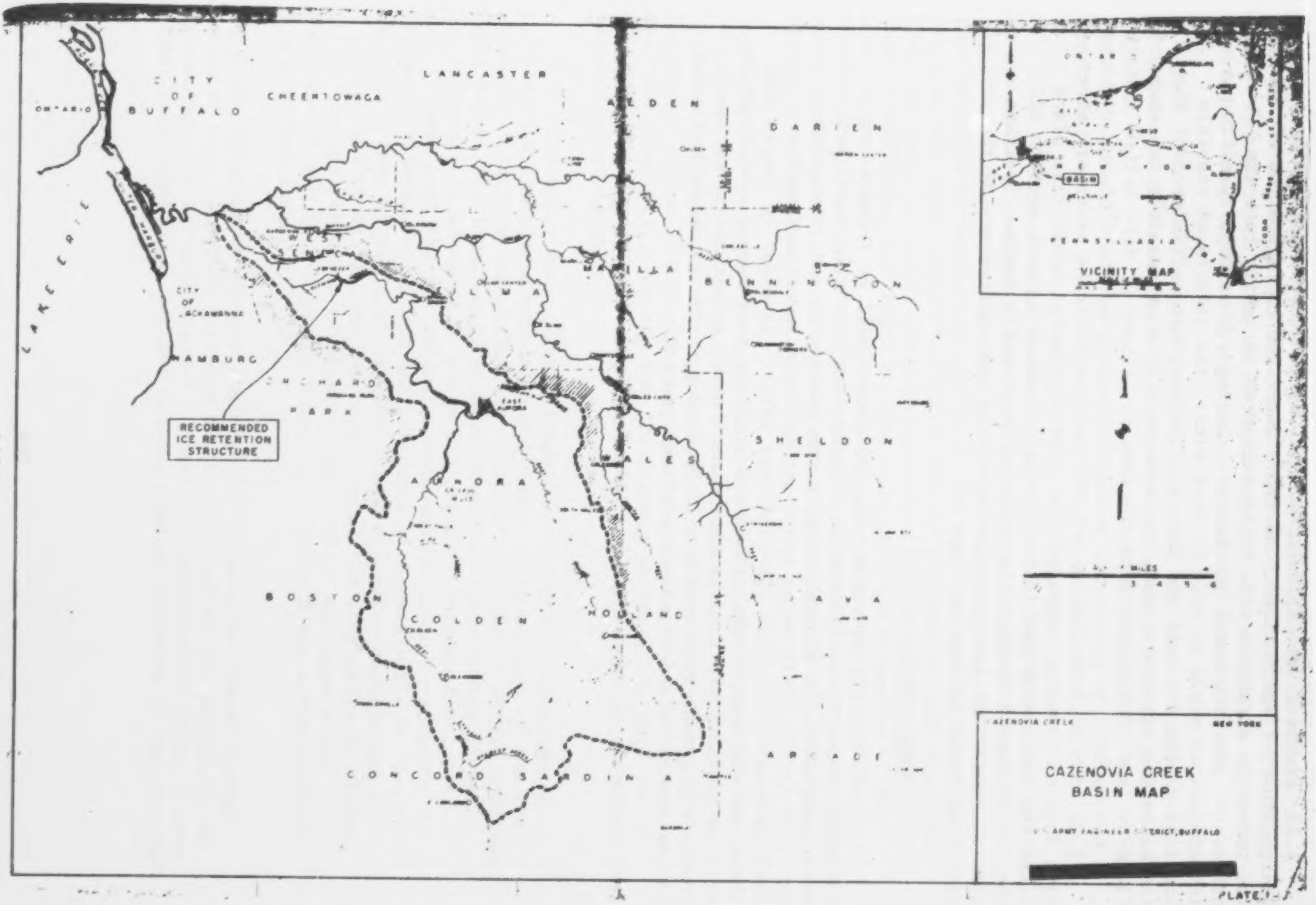
1.18 Three gated 36-inch drainage pipes would be placed through the lower weir to permit drainage of the pool behind the structure for maintenance and sediment removal. These are sufficiently large to pass normal summertime flows without causing ponding upstream of the structure.

1.19 Provided the implementation study (Advanced Engineering and Design Study) is authorized, the above described configuration of the ice retention structure will be investigated to verify both its structural and functional adequacies. During such study, specific investigations would be made to determine: the effects of possible loadings on the ice boom and dam; the ice-retaining efficiency of the ice retention structure; and, the erosive effect of possible two-stage flows on lands downstream from the dam.

1.20 Annual installation of the ice boom would be necessary after five days of freezing temperatures. Spring removal would take place after the ice has melted in the spring. Damaged or worn section of the ice boom would have to be replaced on a yearly basis. Sediment removal behind the ice retention structure and maintenance of the structure would be done as required.

1.21 Monitoring

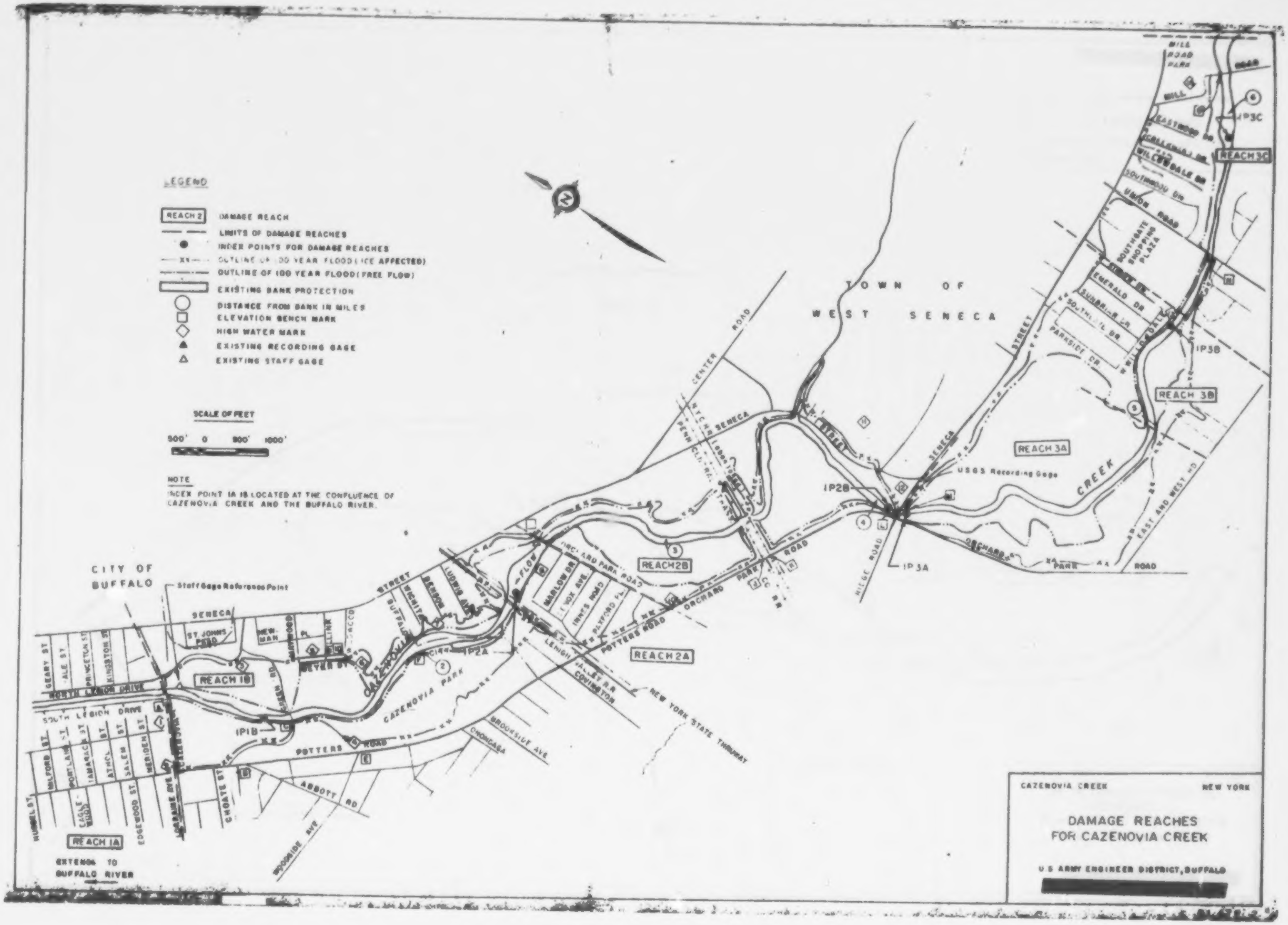
1.22 During construction, the Contractor will be required to minimize temporary environmental impacts such as noise, dust, and water turbidity, in accordance with the procedures and regulations outlined in the Civil Works Construction Guide Specification for Environmental Protection (CE-1300, May 1970). In order to insure that these procedures and regulations are properly implemented, construction will be monitored by a Corps inspector. After construction has been completed, annual inspections will be conducted by the Corps to insure proper operation and maintenance of the project.


LAKE ERIE
ONTARIO
CITY OF BUFFALO
CHEEKTOWAGA
LANCASTER
ALDEN
DARIEN
WEST SENECA
ELMA
MARILLA
BENNINGTON
CITY OF LACKAWANNA
HAMBURG
ORCHARD PARK
EAST AURORA
WALES
SHELDON
AURORA
BOSTON
COLDEN
HOLLAND
JAVA
CONCORD
SARDINIA
ARCADE
RECOMMENDED ICE RETENTION STRUCTURE
MILES
3
4
5
6
ONTARIO
NEW YORK
BASIN
PENNSYLVANIA
VICINITY MAP
CAZENOVIA CREEK
NEW YORK

CAZENOVIA CREEK
BASIN MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 1-7



LEGEND
REACH 2 DAMAGE REACH
LIMITS OF DAMAGE REACHES
INDEX POINTS FOR DAMAGE REACHES
OUTLINE OF 100 YEAR FLOOD (ICE AFFECTED)
OUTLINE OF 100 YEAR FLOOD (FREE FLOW)
EXISTING BANK PROTECTION
DISTANCE FROM BANK IN MILES
ELEVATION BENCH MARK
HIGH WATER MARK
EXISTING RECORDING GAGE
EXISTING STAFF GAGE
SCALE OF FEET
500' 0 500' 1000'
TOWN OF WEST SENECA
CITY OF BUFFALO
Staff Gage Reference Point
REACH 1A
EXTENDS TO BUFFALO RIVER
REACH 1B
IP1B
REACH 2A
REACH 2B
IP2A
IP2B
REACH 3A
REACH 3B
REACH 3C
IP3A
IP3B
IP3C
USGS Recording Gage
CAZENOVIA PARK
CREEK
SOUTHGATE SHOPPING PLAZA
NEW YORK STATE THRUWAY
LEHIGH VALLEY R.R.
N.Y.C.H.R.
PENN CENTRAL R.R.
CENTER ROAD
SENECA STREET
ORCHARD PARK ROAD
POTTERS ROAD
RIDGE ROAD
EAST AND WEST RD
UNION ROAD
MILL ROAD
ABBOTT RD
CHOATE ST
NORTH LEGION DRIVE
SOUTH LEGION DRIVE
LORRAINE AVE
GEARY ST
PRINCETON ST
KINGSTON ST
MILFORD ST
PORTLAND ST
TAMARACK ST
ATHOL ST
SALEM ST
MERIDEN ST
EDGEWOOD ST
HUMBER ST
EAGLE
BROOKSIDE AVE
CHONGAGA
COVINGTON
ST JOHNS
NEWMAN PL
BEYER ST
LUDWIG AVE
BENSON
WICHITA
BUFFALO
MARLOW DR
LENOX AVE
INNES ROAD
PAYFORD PL
EMERALD DR
SUNBRIAR DR
PARKSIDE DR
EASTWOOD DR
WILLOWDALE DR
SOUTHWOOD DR
FLOW

NOTE

INDEX POINT 1A IS LOCATED AT THE CONFLUENCE OF CAZENOVIA CREEK AND THE BUFFALO RIVER.

CAZENOVIA CREEK NEW YORK

DAMAGE REACHES
FOR CAZENOVIA CREEK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

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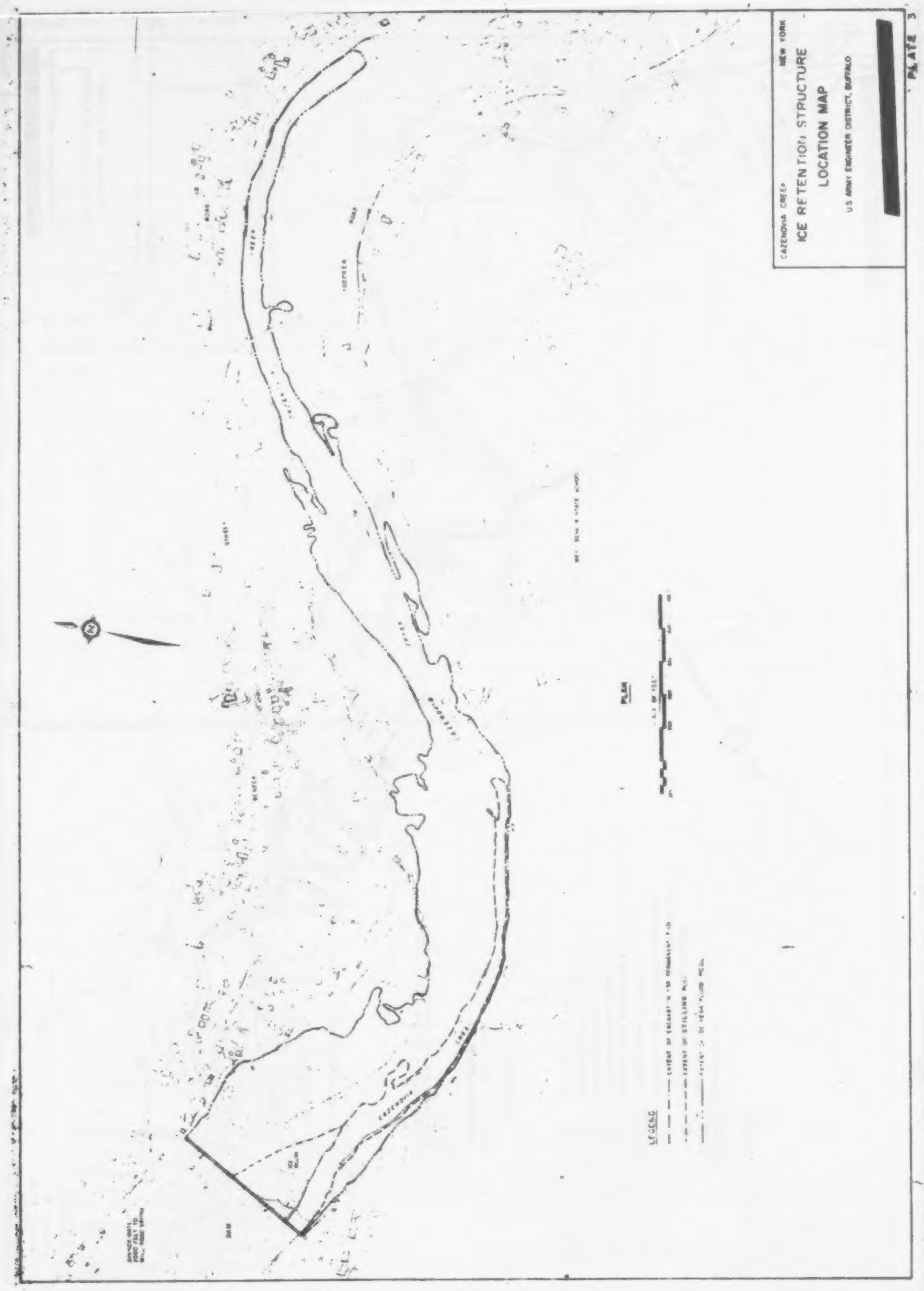

PLAN
LEGEND
CAZENOVIA
CREEK

CAZENOVIA CREEK NEW YORK

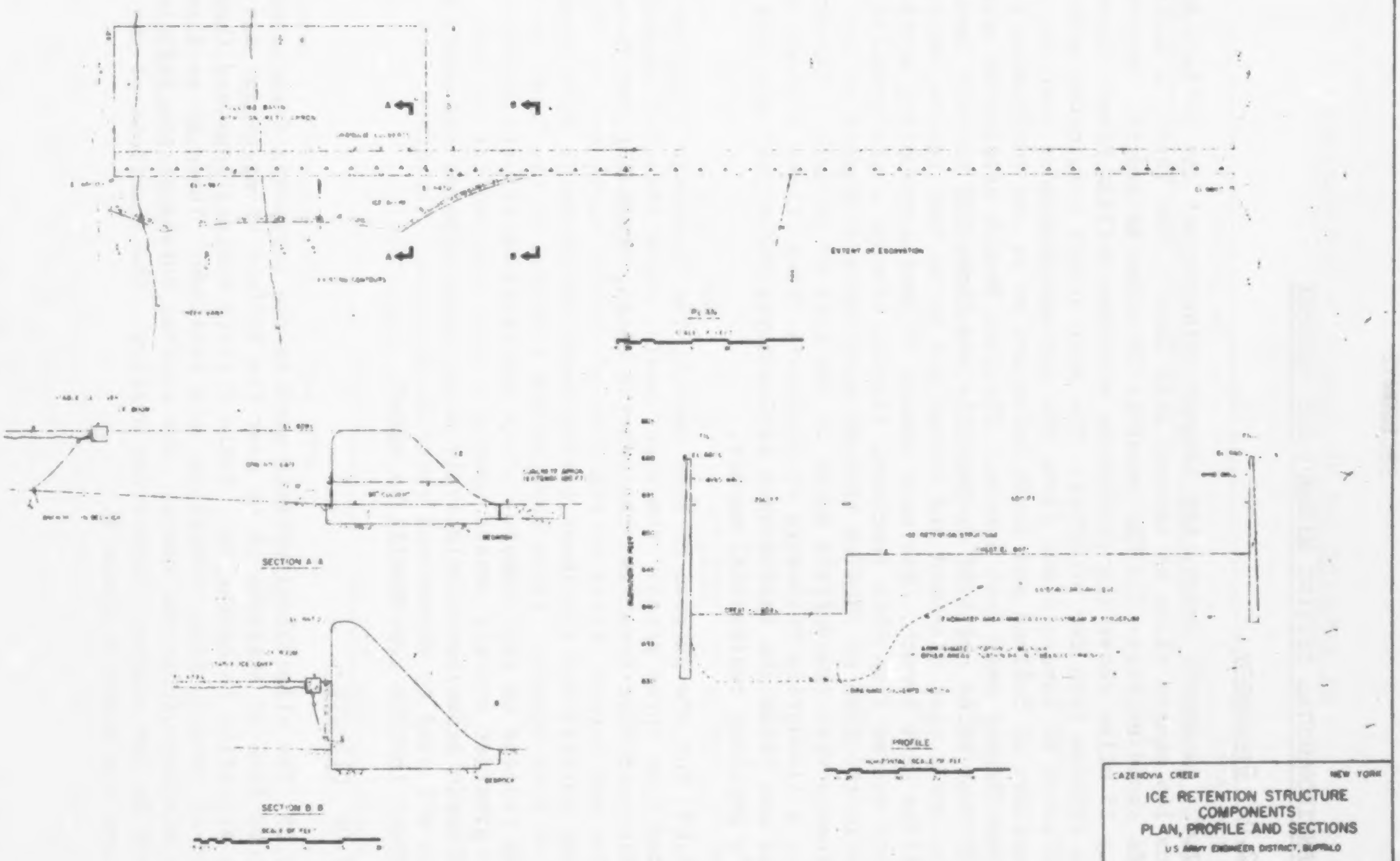
ICE RETENTION STRUCTURE

LOCATION MAP

US ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 3


A
B
EXTENT OF EXCAVATION
EXISTING CONTOURS
PLAN
SCALE OF FEET
ELEVATION IN FEET
ICE RETENTION STRUCTURE
PROFILE
HORIZONTAL SCALE OF FEET
BEDROCK
SECTION A-A
SECTION B-B
SCALE OF FEET

CAZENOVIA CREEK NEW YORK

ICE RETENTION STRUCTURE
COMPONENTS
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 4

2. ENVIRONMENTAL SETTING WITHOUT THE PROJECT

2.01 Geography

2.02 Cazenovia Creek, the largest tributary of the Buffalo River, drains 144 square miles of central Erie County, New York. A basin map is shown on Plate 1. The creek is 39 miles in length. Approximately 17 miles above its confluence with the Buffalo River, Cazenovia Creek divides into two branches. The East Branch originates some four miles north of Sardinia and flows NNW through farmlands past the rural communities of Holland and South Wales and on to its confluence with the West Branch near East Aurora. The West Branch originates approximately four miles north of Springville and flows NNE through farm and wooded areas past Glenwood and Colden and on to East Aurora, where it joins the East Branch. The main stream follows a wandering northwestern course from this juncture, flowing through a steep-walled gorge in the Town of Elma on through suburban West Seneca to its confluence with the Buffalo River in the City of Buffalo. Tannery Brook, a floodprone tributary of Cazenovia Creek, flows through East Aurora and joins the East Branch of Cazenovia Creek just south of the town's populous residential sector.

2.03 For the purpose of this report, the Cazenovia Creek basin is divided into three parts: the upper basin, above the confluence of the East and West Branches; the central basin, including the Towns of Elma and Aurora, parts of the Town of Orchard Park, and the Village of East Aurora; and the lower basin, comprised of South Buffalo and the Town of West Seneca. Flood damages are greatest in the lower basin and in the Village of East Aurora. Proposed remedial efforts would have their greatest overall impact upon the lower and central basins. The upper basin experiences relatively minor flood damages and would be little affected by downstream remedial measures. Therefore, its treatment in this report will be brief.

2.04 Climate

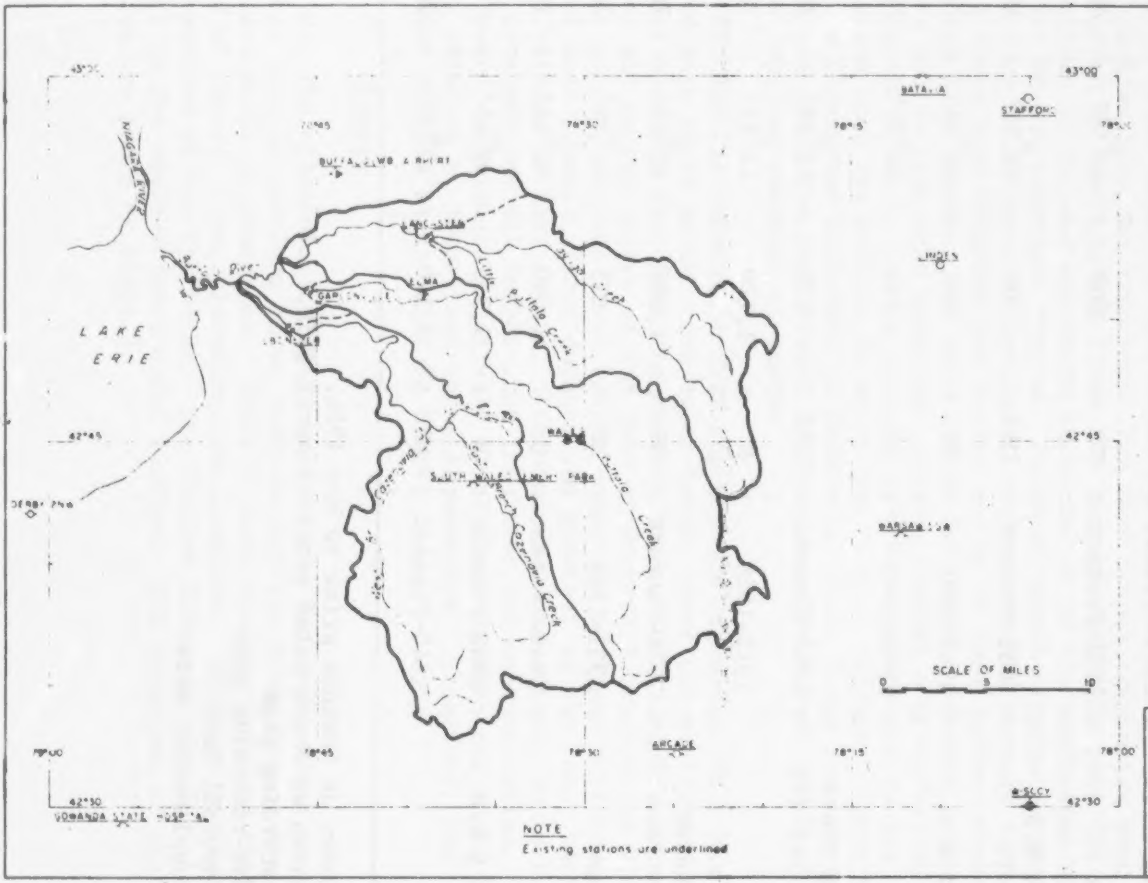
2.05 The climatological data used in the Cazenovia Creek study was obtained from 12 stations in or near the Buffalo River basin, ten of which are still in operation. Table 2 lists the stations and their period of record, type, elevation, and location. There is no first-order station within the basin. The Weather Bureau at the Buffalo Airport is the nearest first-order station. The locations of the stations are shown on Plate 5.

Table 2

Climatological Station in and Adjacent to Buffalo River Basin

Station	Period of Record	Type	Elevation	Location	
				Latitude	Longitude
Arcade	1889-1907 1943-Present	NH	1,480	42°32'	78°25'
Batavia	1931-Present	CH	900	43°00'	78°11'
Buffalo W.B. Airport	1832-Present	CHJ	705	42°56'	78°44'
Derby 2 N.W.	1945-1961	NH	660	42°42'	79°00'
Elma	1942-1960	CH	765	42°51'	78°39'
Gowanda State Hospital (1)	1945-Present	CHJ	870	42°29'	78°56'
Linden	1912-1968	N	1,120	42°53'	78°10'
South Wales Emery Park (2)	1931-Present	NH	1,090	42°43'	78°36'
Stafford	1931-1969	NH	915	42°59'	78°05'
Wales	1948-Present	C	1,090	42°44'	78°31'
Warsaw 5 S.W.	1952-Present	N	1,715	42°41'	78°12'
Wiscoy	1940-Present	NH	1,140	42°30'	78°05'

(1) Known as Gowanda prior to May 1951.
(2) Known as South Wales prior to April 1951.
C - Recording gage
N - Non-recording gage
H - Snowfall Data
J - Supplemental data


43°00
78°45
78°30
78°15
78°00
42°45
42°30
79°00
BATAVIA
STAFFORD
BUFFALO WB AIRPORT
NIAGARA RIVER
Buffalo River
LAKE ERIE
LANCASTER
ELMA
GARDENVILLE
EBENEZER
Little Buffalo Creek
Buffalo Creek
Cayuga Creek
WALES
SOUTH WALES ENGHT PARK
Cazenovia Creek
East Branch Cazenovia Creek
INDEX
WARSAW
DERBY 2NW
ARCADE
DELEVAN
GOWANDA STATE HOSPITAL
STATION LEGEND
● ◐ PRECIPITATION ONLY
◆ ◐ PRECIPITATION AND TEMPERATURE
TYPE OF GAGE
○ NON-RECORDING
● RECORDING
◐ BOTH TYPES
○ RIVER GAGE STATION
● U.S.G.S. WATER STAGE RECORDER
SCALE OF MILES
0
5
10

NOTE
Existing stations are underlined

CAZENOVIA CREEK NEW YORK

HYDROLOGIC STATION MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 5

2.06 Precipitation data for the Buffalo River basin is contained in Table 3 which lists average monthly and annual values, and combined averages for all weather stations. The average annual precipitation of all the stations throughout the basin is 36.92 inches. Monthly averages for the twelve stations vary from a minimum of 2.53 inches in February to a maximum of 3.33 inches in May. The highest average monthly precipitation, 4.34 inches, occurs in September at the South Wales Emergy Park station. The lowest average monthly precipitation, 2.07 inches, occurs in January at the Wiscoy Station. Average annual precipitation varies from 31.27 inches at Stafford to 40.96 inches at South Wales Emery Park. Plate 6 shows rainfall contours for the Cazenovia Creek basin.

2.07 Snowfall data is given in Table 4. The average annual snowfall for the stations shown is 82.3 inches. The highest monthly average snowfall is 22.4 inches, occurring in January at Arcade. Plate 7 gives snowfall contours for the study area.

2.08 Temperature data is presented in Table 5. The average annual temperature of the ten stations shown is 46.9 degrees Fahrenheit. The maximum average monthly temperature is 69.2 degrees Fahrenheit occurring in July, while the minimum is 24.2 degrees Fahrenheit, in January.

2.09 Air Quality

2.10 Air quality data have been compiled since 1966 by the Air Pollution Control Division of the Erie County Department of Health. Table 6, derived from the County's "1973 Annual Report," lists mean levels of suspended particulates and sulfation rate (a measure of atmospheric oxides of sulfur) for the years 1966 and 1972. The improvement noted is attributed to strict enforcement of Air Pollution Codes written in 1967. According to County Codes, the maximum permissible annual geometric mean level of suspended particulates is 75 micrograms/cubic meter and the maximum permissible annual arithmetic mean rate of sulfation is 0.4 milligrams sulfate/cm^2/30 days. High pollutional levels occur in the vicinity of and downwind from major industrial zones. In the Cazenovia Creek basin, air pollution problems are generally confined to South Buffalo and the northwestern corner of West Seneca.

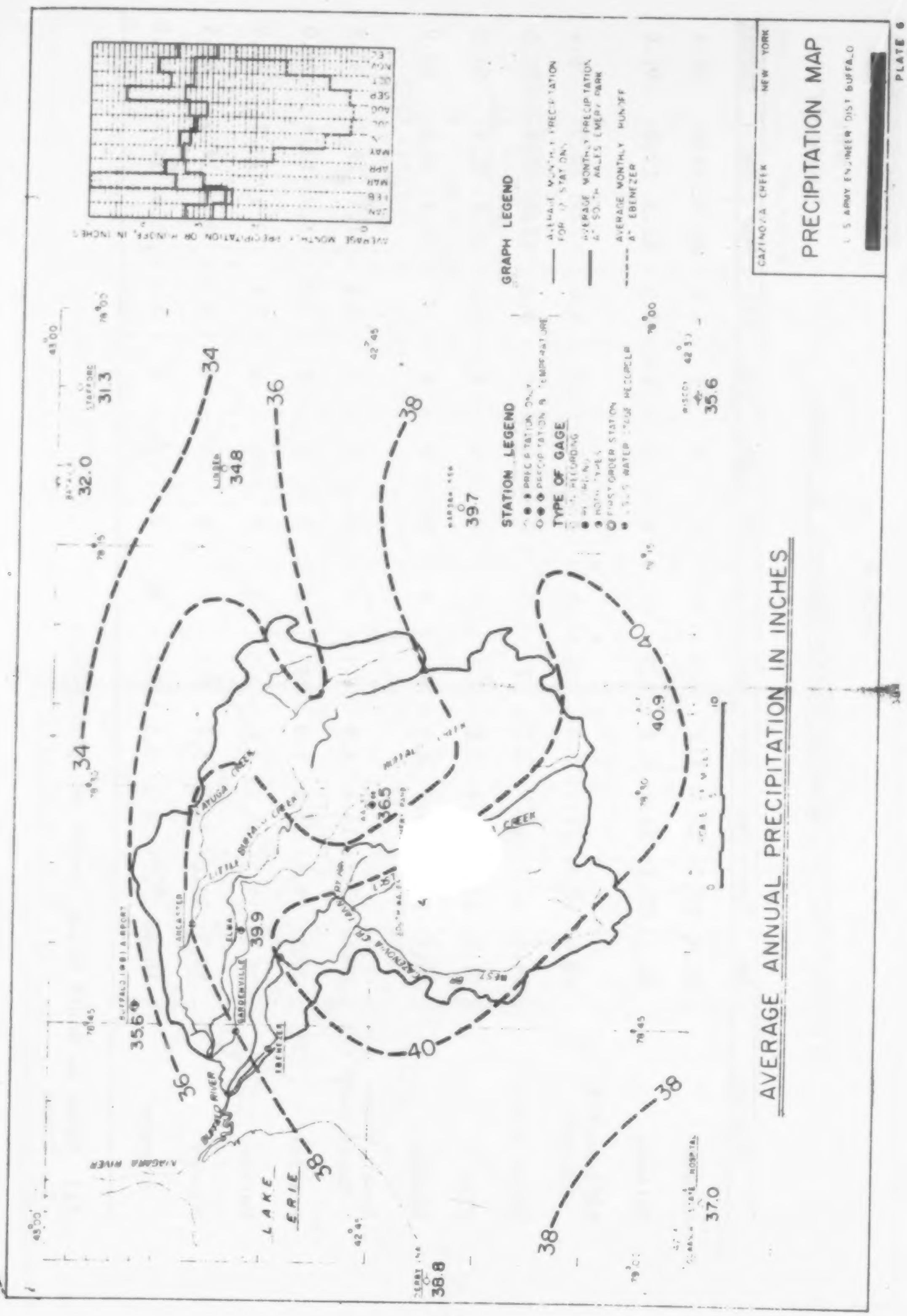
2.11 Topography

2.12 The basin is characterized by a series of nearly level plains rising to the south, bounded by steep escarpments facing north. The East and West Branches of Cazenovia Creek have deeply eroded the northern edge of the Allegheny Plateau, highest of these plains. Eroded materials are deposited on the Erie Plain, where the creek becomes wide and sluggish and the channel partially obstructed by extensive shoals. Topographic data for Cazenovia Creek are given in Table 7.

Average Monthly Precipitation in Inches

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	3.17	2.61	3.01	3.19	4.01	4.17	3.91	3.64	3.66	3.36	3.10	3.10	40.93
Batavia	2.19	2.25	2.60	2.99	3.10	2.77	2.89	3.08	2.72	2.60	2.58	2.26	32.03
Buffalo W. B. Airport	3.11	2.83	2.84	2.62	2.93	2.78	2.89	2.94	3.09	3.18	3.14	3.20	35.55
Derby 2 N.W.	3.05	2.50	3.07	3.67	3.67	2.95	2.51	3.11	3.77	3.57	4.30	2.84	38.84
Elma	3.74	2.99	3.39	3.65	3.53	2.79	3.08	3.02	3.78	3.44	3.95	3.11	39.91
Gowanda State Hospital (1)	2.82	2.44	2.77	3.32	3.39	3.54	3.33	3.08	3.28	3.13	3.15	2.71	36.96
Linden	2.37	2.30	2.61	3.01	3.07	3.46	3.25	3.28	3.07	3.19	2.92	2.31	34.83
South Wales Emery Park (2)	3.25	2.86	3.43	3.64	3.33	3.37	3.08	2.89	4.34	3.56	3.77	3.44	40.96
Stafford	2.21	2.24	2.42	2.89	3.02	2.69	2.84	2.94	2.81	2.65	2.48	2.08	31.27
Wales	2.92	2.51	3.36	3.39	3.09	2.64	3.24	2.94	3.04	3.11	3.05	3.19	36.48
Warsaw 5 S.W.	2.92	2.81	3.43	4.00	3.20	3.46	3.19	4.25	3.05	3.55	2.99	2.84	39.69
Wiscoy	2.07	2.11	2.76	3.27	3.59	3.66	3.74	3.39	3.15	2.87	2.74	2.29	35.64
Average	2.78	2.53	2.97	3.30	3.33	3.19	3.16	3.21	3.31	3.18	3.18	2.78	36.92

(1) Known as Gowanda, prior to May 1951.
(2) Known as South Wales, prior to April 1951.


AVERAGE MONTHLY PRECIPITATION OR RUNOFF, IN INCHES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
GRAPH LEGEND
AVERAGE MONTHLY PRECIPITATION FOR 17 STATIONS
AVERAGE MONTHLY PRECIPITATION AT SOUTH WALES EMERY PARK
AVERAGE MONTHLY RUNOFF AT EBENEZER
STATION LEGEND
PRECIPITATION ONLY
PRECIPITATION & TEMPERATURE
TYPE OF GAGE
RECORDING
NON-RECORDING
BOTH TYPES
FIRST ORDER STATION
U.S.G.S. WATER STAGE RECORDER
34
36
38
40
STAFFORD 31.3
BATAVIA 32.0
LINDEN 34.8
WARSAW 39.7
35.6
40.9
36.5
39.9
BUFFALO (WB) AIRPORT 35.6
DERBY 38.8
GOWANDA STATE HOSPITAL 37.0
CAYUGA CREEK
LITTLE BUFFALO CREEK
LANCASTER
ELMA
GARDENVILLE
EBENEZER
BUFFALO RIVER
NIAGARA RIVER
LAKE ERIE
CAZENOVIA CREEK
WEST BR
EAST BR
SOUTH WALES
BUFFALO CREEK
SCALE IN MILES
0 10
43°00'
42°45'
42°30'
79°00'
78°45'
78°30'
78°15'
78°00'

AVERAGE ANNUAL PRECIPITATION IN INCHES

CAZENOVIA CREEK NEW YORK

PRECIPITATION MAP

U.S. ARMY ENGINEER DIST BUFFALO

[redacted]

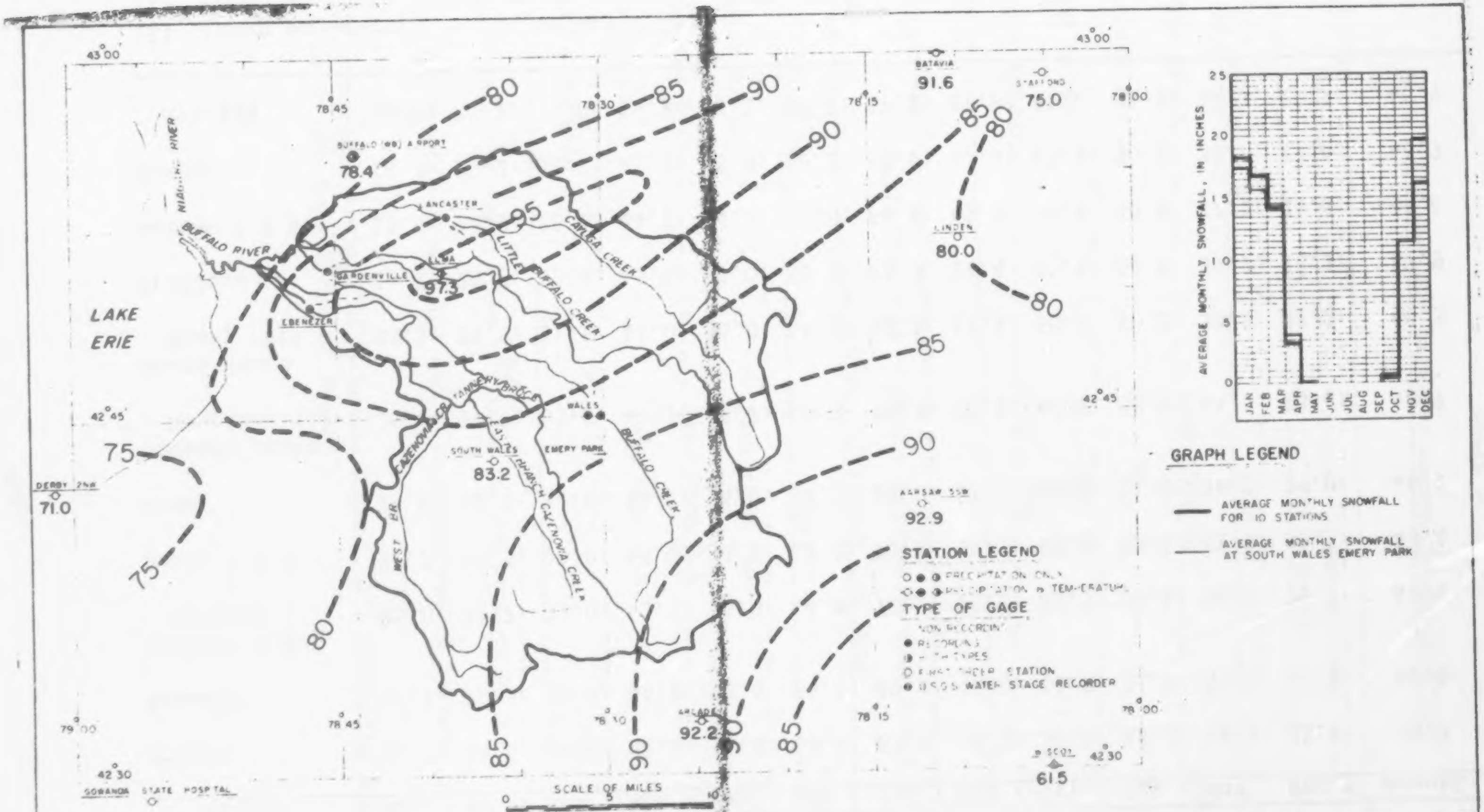
PLATE 6

Table 4

Average Monthly Snowfall in Inches

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	22.4	17.5	15.2	4.1	0.3	T	0	0	T	1.3	11.8	19.6	92.2
Batavia	20.1	21.5	16.0	4.2	0.3	0	0	0	T	0.3	11.3	17.6	91.6
Buffalo W.B. Airport	19.6	17.6	11.5	3.2	0.2	0	0	0	T	0.4	7.9	18.0	78.4
Derby 2 N.W.	16.2	11.5	10.9	1.3	T	0	0	0	0	0.1	15.1	15.9	71.0
Elma	21.8	18.4	15.4	2.6	0.1	0	0	0	T	0.1	17.8	21.1	97.3
Linden	19.7	19.2	13.1	2.9	0	0	0	0	0	T	10.4	14.8	80.0
South Wales Emery Park (1)	17.4	15.7	14.4	3.9	0.1	T	0	0	0	0.6	11.4	19.7	83.2
Stafford	16.1	18.1	15.1	3.0	T	0	0	0	0	2.0	8.9	13.6	75.0
Warsaw	18.5	17.3	19.6	7.0	0.3	0	0	0	0	0.5	12.5	17.2	92.9
Wiscoy	12.5	13.0	11.8	1.6	0.1	0	0	0	0	0.1	8.4	14.0	61.5
Average	18.4	17.0	14.3	3.3	0.1	T	0	0	T	0.4	11.6	16.2	82.3

(1) Known as South Wales, prior to April 1951.
T - Trace


43°00
78°45
78°30
78°15
78°00
42°45
42°30
79°00
LAKE ERIE
NIAGARA RIVER
BUFFALO RIVER
BUFFALO (WB) AIRPORT
78.4
LANCASTER
GARDENVILLE
ELMA
97.3
EBENEZER
CAYUGA CREEK
LITTLE BUFFALO CREEK
BUFFALO CREEK
TANNERY BROOK
CAZENOVIA CR
WEST BR
EAST BRANCH CAZENOVIA CREEK
WALES
SOUTH WALES
83.2
EMERY PARK
DERBY 2NE
71.0
GOWANDA STATE HOSPITAL
ARCADE
92.2
AARSAW 5SW
92.9
BATAVIA
91.6
STAFFORD
75.0
LINDEN
80.0
SCOTT
61.5
75
80
85
90
95
SCALE OF MILES
0
5
10
AVERAGE MONTHLY SNOWFALL, IN INCHES
0
5
10
15
20
25
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
GRAPH LEGEND
AVERAGE MONTHLY SNOWFALL FOR 10 STATIONS
AVERAGE MONTHLY SNOWFALL AT SOUTH WALES EMERY PARK
STATION LEGEND
PRECIPITATION ONLY
PRECIPITATION & TEMPERATURE
TYPE OF GAGE
NON RECORDING
RECORDING
BOTH TYPES
FIRST ORDER STATION
U.S.G.S. WATER STAGE RECORDER

AVERAGE ANNUAL SNOWFALL IN INCHES

CAZENOVIA CREEK NEW YORK

SNOWFALL
MAP

U S ARMY ENGINEER DIST BUFFALO

[redacted]

PLATE [illegible]

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Table 5

Average Monthly Temperature in Degrees Fahrenheit

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	21.2	24.6	30.0	44.5	54.8	63.4	67.1	66.1	59.4	49.2	38.1	25.6	45.3
Batavia	23.9	25.2	32.6	44.9	55.4	65.5	69.2	68.1	61.2	51.4	39.2	27.3	47.0
Buffalo W.B. Airport	25.0	24.7	32.0	43.0	54.3	64.8	70.1	68.5	62.3	51.1	39.4	29.2	47.1
Derby 2 N.W.	27.7	27.5	33.0	45.0	54.2	65.0	70.1	69.3	62.9	53.4	41.9	30.9	48.4
Elma	24.8	25.8	32.5	44.7	54.6	64.5	69.0	67.7	60.6	51.0	39.3	28.0	46.9
Gowanda State Hospital (1)	26.6	27.7	33.6	47.1	56.7	66.3	70.5	69.2	63.1	53.9	41.4	28.6	48.7
South Wales Emery Park	23.8	23.9	31.5	44.0	55.0	64.6	69.1	67.4	60.4	50.2	38.3	27.3	46.3
Stafford	24.7	24.7	32.6	45.4	57.0	66.9	71.3	69.4	62.4	52.0	39.7	28.3	47.9
Warsaw 5 S.W.	19.9	22.9	28.1	44.3	54.1	63.0	66.6	65.7	59.3	49.6	37.1	24.6	44.6
Wiscoy	24.3	25.2	32.2	45.6	55.8	65.3	69.1	67.4	60.9	50.7	38.7	27.4	46.9
Average	24.2	25.2	31.0	44.9	55.2	64.9	69.2	67.9	61.2	51.3	39.3	27.7	46.9

(1) Known as Gowanda, prior to May 1951.
(2) Known as South Wales, prior to April 1951.

Table 6

Air Quality Data For Cazenovia Creek Basin*

Suspended Particulates - Annual Geometric Mean Level[1], Micrograms Per Cubic Meter

Location	1966	1973
Upper Basin	less than 60	less than 40
Central Basin	60 - 80	less than 50
West Seneca	80 - 140	50 - 90
South Buffalo	160 - 200	90 - 120

Sulfation Rate - Annual Arithmetic Mean Level[2], Milligrams Sulfate/cm^2/30 Days

Location	1966	1973
Upper Basin	less than 0.4	less than 0.2
Central Basin	less than 0.4	less than 0.2
West Seneca	less than 0.8	less than 0.3
South Buffalo	0.8 - 1.2	0.4

1. Geometric Mean: The nth root of the product of n measurements.

2. Arithmetic Mean: The sum of n measurements divided by n.

*Data adapted from: "1973 Annual Report, Air Pollution Control Division, Erie County Department of Health".

best copy available

Table 7

Cazenovia Creek Topographic Data

Reach	Length, Mi.	Upstream Elevation Ft.	Downstream Elevation Ft.	Average Slope Ft./Mi.	Drainage Area, Sq. Mi.
Main Stream below confluence of East and West Branch	17	805	576	13.5	26
East Branch	21	1,760	805	45.5	57
East Aurora to Holland	15	1,080	805	18.3	39
Holland to Source	6	1,760	1,080	113.3	18
West Branch	19	1,700	805	47.1	61
East Aurora to Colden	10	1,060	805	25.5	34
Colden to Source	9	1,700	1,060	71.1	27

2.13 Along much of its length, Cazenovia Creek is a shallow stream during most of the year. Its bed is largely a pavement of bare or silt-dusted rock, either gray-black flaky shale or hard massive limestone, interrupted periodically by extensive gravel shoals. The streambed is graded in an irregular step-like manner. In places, small scarps are formed as limestone outcroppings with underlying shale are undercut. Between scarps, flow may be so slow during low water conditions that its direction cannot be determined at a glance. Notably lacking are deep pools which might harbor large fish. The average summertime depth of the stream is certainly less than 1-foot over much of its length. Well developed riffle areas are uncommon and generally limited in extent. This is very likely due to the character of the bedrock, which erodes into predominantly large blocky boulders (limestone) or small flake-like chips (shale), neither creating sufficient turbulence in such a slow stream to form well developed riffles.

2.14 The character of the stream changes markedly near its confluence with the Buffalo River. Even during moderate stages the river backs up into the creek channel, so that surface waters may flow upstream in the lowest reaches of the creek. This backwater effect has led to the formation of an extensive sediment pool with an attendant increase in turbidity.

2.15 The course of Cazenovia Creek downstream of Spring Brook was considerably modified by the northward retreat of the ice front during the final stages of the last glaciation. This ice sheet was also responsible for the generally subdued topography and the glacial, fluvio-glacial, and lacustrine deposits in the study area.

2.16 Geological Investigation

2.17 The geological investigation commenced with a review of published geological literature. Geotechnical references are listed in the bibliography. Data on the bedrock of the basin area is given by Broughton et. al. (1962) and Buehler and Tesmer (1963). A review of the geologic history of the area, with emphasis on postglacial lakes in the area, is given by Calkin (1969).

2.18 Data on the superficial geology of the area is given in two unpublished M.A. theses from the Department of Geology, State University of New York at Buffalo (Blackman 1956 and Symecko 1967). Superficial geology maps of portions of the basin are given in these theses. Data on the ground water resources of the area is published by Reck and Simmons (1952) and La Sala (1968).

2.19 The published data was supplemented by interviews with staff of the Department of Geology, University of Buffalo and staff of the Soil Conservation Service, U. S. Department of Agriculture, East Aurora, New York.

2.20 Geologic field mapping was undertaken for five days during September 1973 to verify and confirm the published data previously gathered.

2.21 Valley cross-sections, based upon testhole drilling, are available for the two damsites which have been investigated on Cazenovia Creek during the last decade - the Spring Brook Site investigated by the U. S. Army Corps of Engineers in 1963 and a site located some 4,500 feet upstream investigated by the New York State Department of Environmental Conservation during 1967.

2.22 Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. The United States Department of the Interior - Bureau of Mines indicates that these mineral resources are widespread throughout

Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be effected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated.

2.23 Bedrock Geology

2.24 The bedrock underlying the study area consists of sedimentary formation of Middle and Upper Devonian age. The geologic column and description of rock units is given in Table 8 and the bedrock geology is shown on Plate 8.

2.25 Apart from the Onondaga limestone which appears at the surface in the extreme northwest of the study area, the bedrock sequence traversed by Cazenovia Creek is composed of 600 feet of predominantly dark grey and black shales of Middle and Upper Devonian age dipping to the south at approximately 40 feet per mile. This is locally affected by minor folding which may modify the dip to as much as 60 feet per mile or as little as 17 feet per mile (de Witt, 1956). The strike of the beds is uniformly east-west. Interbedded with the shales are numerous thin, impure limestones, siltstones, and large calcareous concretions up to 6 feet in diameter.

2.26 Jointing is best developed in the massive shale members, often occurring as two diagonal sets. From field observations in Cazenovia valley, the dominant joint set appears to be vertical, striking approximately east-west.

2.27 Where undercut by stream erosion, the shale cliffs are stable at near vertical angles and cliffs up to 100-foot high, sloping at 10 degrees from vertical (5 vertical to 1 horizontal), show little or no landslip activity. Weathering of the rock appears to be rapid and penetrates to depths of over a foot in the more fissile shales leaving a friable surface. The shales are nonporous with low permeability.

2.28 Surficial Geology

2.29 The surficial geology of the study area is largely the result of Pleistocene glaciation. The area was subjected to a succession of ice advances and retreats, resulting in deposits of glacial till and a complex pattern of fluvio-glacial and lacustrine sediments. The heterogeneous superficial deposits contrast with the relatively uniform nature of the bedrock geology. Surficial geology exerts a strong influence on groundwater behavior in the study area and is an important factor in assessing the engineering feasibility of major works

Table 8

General Geologic Column of the Area

System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Upper Devonian	Seneca	West Falls	i) Angola Shale	Light grey shale with concretions, impure limestone and siltstone bands throughout	300 ft.
			ii) Rhinestreet Shale	Fissile to massive black petroliferous shale. Numerous large concretions	170 ft.
		Sonyea	i) Cashagua	Olive-grey soft shale with concretionary bands	50-70 ft.
			ii) Middlesex Shale	Black, strongly jointed shale, some concretions	
		Genesee	i) West River Shale	Finely laminated, black petroliferous shale	10-20 ft.
			ii) Genundewa Limestone	Dark grey concretionary shale	
			iii) Penn Yan Shale	Medium-grey nodular limestone	
			iv) Geneseo Shale	Dark grey shale with concretions	

Table 8 (Cont'd)

General Geologic Column of the Area

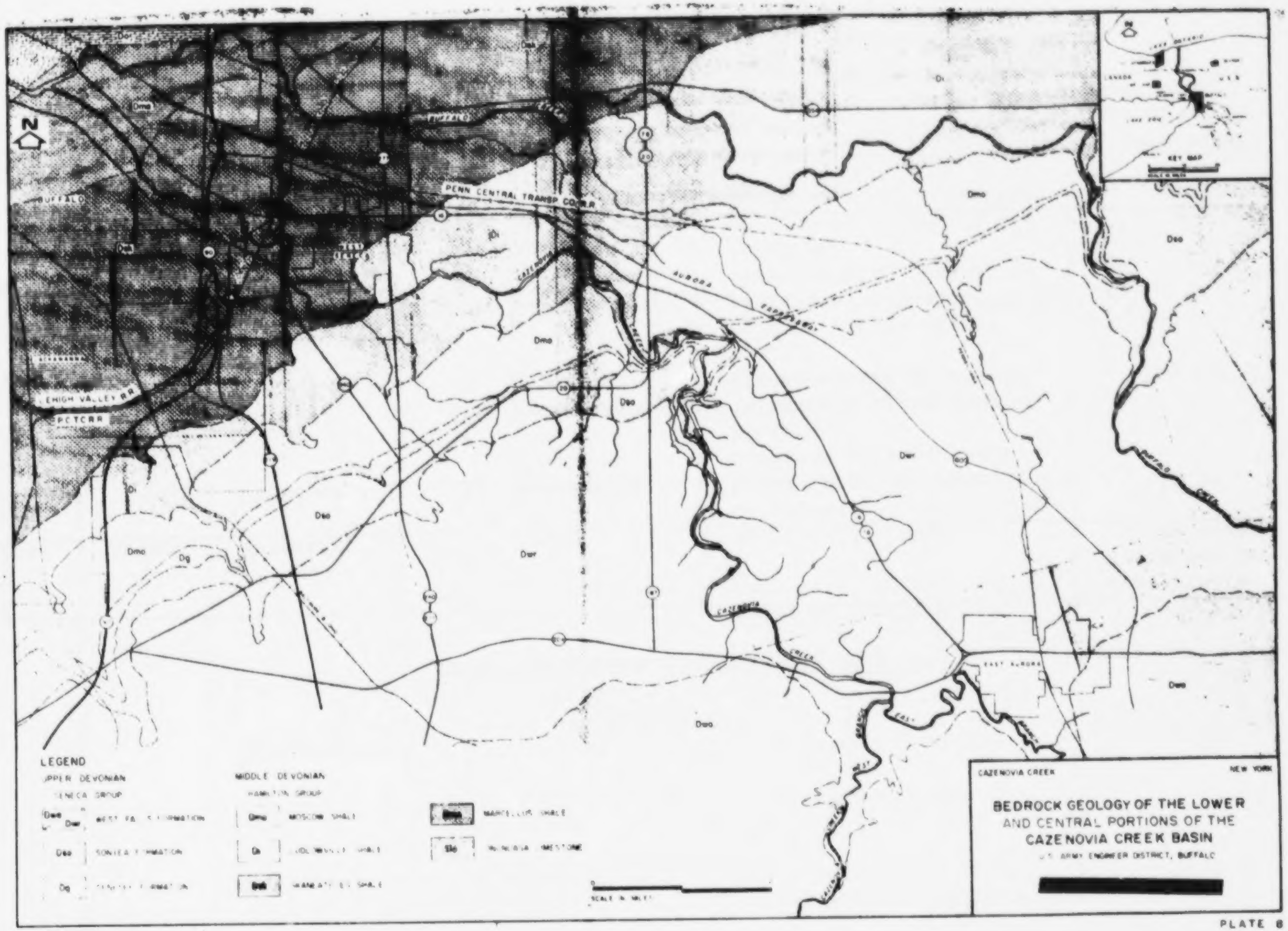
System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Middle Devonian	Hamilton	Moscow	i) Windom Shale	Medium grey to olive-grey calcareous; numerous concretions	45 ft.
			ii) Kashong Shale	Soft grey, thin unit at base of the formation	
		Ludlowville	i) Tichenor Limestone	Massive, thin unit, fossiliferous, resistant to erosion	120 ft.
			ii) Wanakah Shale	Medium grey fossiliferous calcareous, numerous concretions	
			iii) Ledyard Shale	Dark grey, calcareous, numerous partings	
			iv) Centerfield Limestone	Massive thin unit	
		Skaneateles	i) Levanna Shale	Dark grey, calcareous	70 ft.
			ii) Stafford Limestone	Massive fossiliferous unit	
		Marcellus	i) Oatka Creek Shale	Black calcareous shale, calcareous concretions	50 ft.

Table 8 (Cont'd)

General Geologic Column of the Area

System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Middle Devonian	Hamilton	Onondaga	i) Moorehouse Limestone	Light grey limestone, numerous corals, cherty	110 ft.
			ii) Nedrow Limestone	Intermixed light-grey limestone and dark grey chert	
			iii) Edgecliff	Light-grey limestone with chert nodules, coralline locally	

NOTE: All information based on previous studies


N
BUFFALO
PENN CENTRAL TRANSP CO R.R.
LEHIGH VALLEY R.R.
PC TC RR
AURORA
EXPRESSWAY
CAZENOVIA
CAZENOVIA CREEK
EAST
BUFFALO CREEK
EAST AURORA
Dmo
Dso
Dwr
Dwo
Dl
Dg
KEY MAP
LAKE ONTARIO
LAKE ERIE
CANADA
LEGEND
UPPER DEVONIAN
SENECA GROUP
Dwo Dwr WEST FALLS FORMATION
Dso SONYEA FORMATION
Dg GENESEE FORMATION
MIDDLE DEVONIAN
HAMILTON GROUP
Dmo MOSCOW SHALE
Dl LUDLOWVILLE SHALE
Dsk SKANEATELES SHALE
Dma MARCELLUS SHALE
Dlo ONONDAGA LIMESTONE
0
SCALE IN MILES

CAZENOVIA CREEK NEW YORK

BEDROCK GEOLOGY OF THE LOWER
AND CENTRAL PORTIONS OF THE
CAZENOVIA CREEK BASIN

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 8

in this study. Plate 9 shows the surface deposits blanketing the bedrock of the study area and locates several buried valleys representing ice-diverted courses of Cazenovia Creek.

2.30 Thickness of superficial deposits varies from a few feet to a drill-proven depth of over 130 feet north of East Aurora. The major units of overburden encountered in the study area include:

(a) Glacial Till

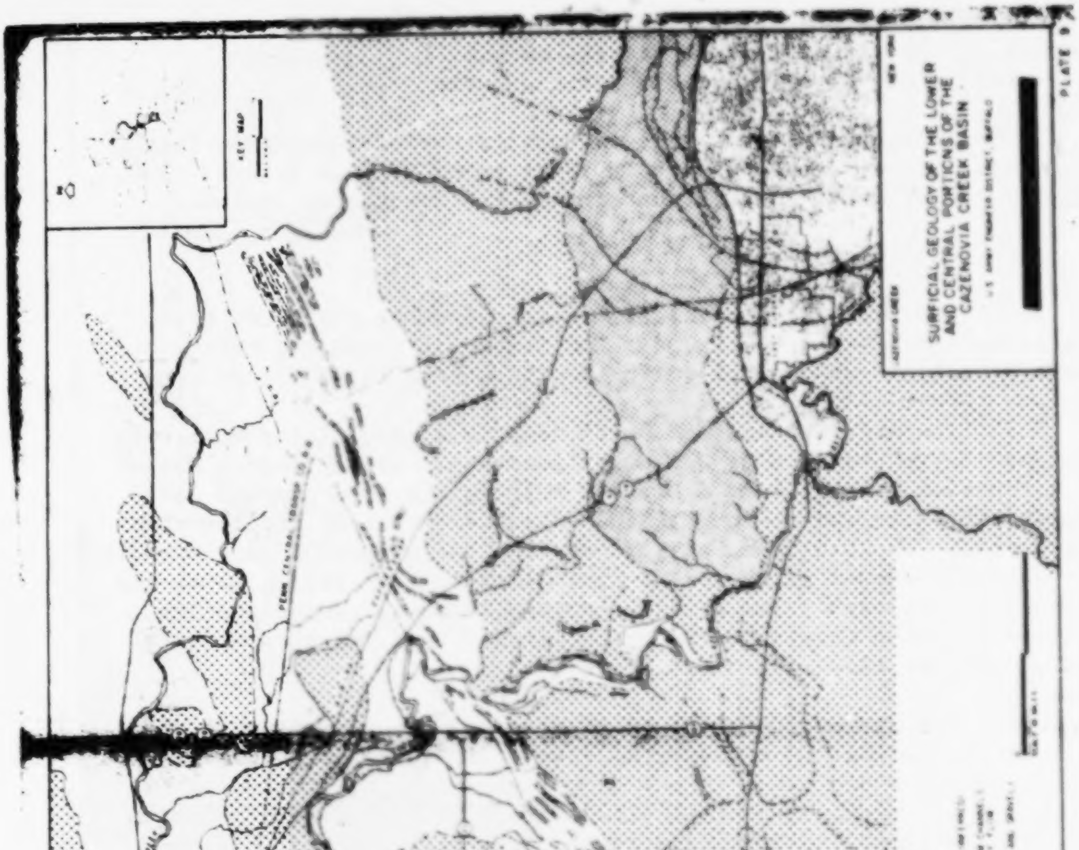
2.31 Two belts of glacial till material cross the study area, the Alden end moraine to the north of Cazenovia Creek and the Hamburg/Marilla end moraine in the southern half of the study area.

2.32 The Alden moraine is predominantly a grey clayey till with abundant large boulders of Onondaga limestone. It is largely masked by a cover of glacial lake sediments originating from glacial lakes Warren and Whittlesey which existed after recession of the ice sheet northwards. Where exposed at surface, the Alden moraine is responsible for relief features in the order of 40 feet west of Spring Brook and 10 feet in the east. The average content of seven representative samples has been determined to be 18 percent sand, 42 percent silt, and 40 percent clay (Symecko, 1967).

2.33 The Hamburg/Marilla end moraine is more important to the present studies as it incorporates a belt 3 miles wide crossing the study area from southwest to northeast. In addition to glacial till, there are ice-marginal contact gravel deposits and outwash deltaic deposits incorporated in this moraine. The till material has been analyzed from five samples to contain 28 percent sand, 37 percent silt, and 35 percent clay. Locally derived bedrock shale provides most of the clay fraction. The color of the till is grey or brown. The depth of till is extremely variable and difficult to assess. Drill hole information and field observations indicate an average depth of approximately 15 feet, but this is increased to over 50 feet where glacial meltwater channels are buried by till. Till-derived colluvial material has built up to similar thicknesses in certain parts of Cazenovia gorge.

(b) Ice Contact Deposits

2.34 The Hamburg moraine deposits include, in addition to a base of unstratified compacted till, thick unevenly distributed sands and gravels or till producing a characteristic "kame and kettle" topography. These deposits were laid down in standing water and stagnant wasting ice at the tip of the receding glacier. They occur in two areas. North of Orchard Park, small kames have been largely removed to provide gravel fill material. North of East Aurora, a contrast in relief of 100 feet


CAZENOVIA CREEK
NEW YORK
U.S. ARMY ENGINEER DISTRICT, BUFFALO
LEGEND
ALLUVIUM
OUTWASH DELTAIC DEPOSITS (SAND, GRAVEL, AND PEBBLES)
GLACIAL LAKE DEPOSITS (CLAYS AND SILTY CLAYS)
GLACIAL LAKE STRAND LINES (SANDS AND GRAVELS)
GLACIAL LAKE LITTORAL SANDS AND GRAVELS
ICE MARGINAL CONTACT DEPOSITS (SANDS AND GRAVELS)
TILL
SYMBOLS
GEOLOGICAL BOUNDARY
GEOLOGICAL BOUNDARY (INFERRED)
BURIED GLACIAL STREAM CHANNELS INDICATING DIRECTION OF FLOW
KAME DEPOSITS (SAND AND GRAVEL)
MORAINE BOUNDARY
SCALE IN MILES
KEY MAP
N
BUFFALO
PENN CENTRAL
LEHIGH VALLEY

SURFICIAL GEOLOGY OF THE LOWER AND CENTRAL PORTIONS OF THE CAZENOVIA CREEK BASIN

PLATE 9

occurs between the flooded kettle holes and adjoining kames. These kames appear to be composed largely of rounded cobbles and locally-derived shale fragments. The proportion of sand is very low (approximately 10 percent). Silt and clay comprise about 50 percent of the material. Water wells in this vicinity have the largest yield of any wells in the unconsolidated deposits of the Buffalo-Niagara Falls region.

2.35 The aquifer zone exists at depths of greater than 40 feet with coefficients of transmissibility of 10,000 to 20,000 gallons per day per foot (gpd/ft). The drill log shown in Table 9 shows a zone of coarse sand and gravel from 48 feet to 123 feet with considerably less silt and clay fraction than was observed at the surface.

(c) Outwash Deltaic Deposits

2.36 The damming effect of the ice that deposited the Hamburg end moraine led to a backup of northward flowing streams and accumulating meltwater which escaped westward, cutting deep drainage channels in the bedrock and depositing coarse, angular gravel and sand in a stratified sequence. The location of these channels is shown on Plate 9. Outwash deposits underlie the Towns of East Aurora and Orchard Park.

(d) Glacial Lake Deposits

2.37 The surficial deposits in the north of the study area owe their origin largely to the existence of a succession of ice-dammed glacial lakes which covered this area between 13,000 and 11,000 years ago. In each lake, a bed of fine clays and silts (frequently laminated) was laid down while coarser debris brought in by tributary meltwater streams and north-flowing rivers accumulated near the shorelines. These are mapped as littoral sands and gravels on Plate 9. The contrast in composition between deep lake sediments and littoral sediments is demonstrated by Symecko (1967). A sample taken from well north in the lake plain contained 4 percent sand, 52 percent silt, and 41 percent clay. Samples containing 19 percent sand, 40 percent silt, and 41 percent clay, and 24 percent sand, 38 percent silt, and 38 percent clay, respectively, represent the progressive coarsening of sediment towards the strand lines marking the edges of the glacial lakes. The lake clays are typically soft, highly plastic with a high natural moisture content.

2.38 The glacial lakes developed semicontinuous beach ridges of fine and coarse gravel. These ridges cross the valley shoulders at a point 1/2 mile upstream from Spring Brook. The relevance of these ridges to the present study is their influence on lateral groundwater distribution and their presence on the abutments of possible dam sites. They might also serve as a source of pervious fill material for dam construction. These ridges have a present elevation of 760 feet and

Table 9

Drill Log

Water Well W10, East Aurora Water Works (See Plate 8 for location)

Number	Feet	Description
1	1 to 6	Topsoil muck.
2	6 to 48	Blue-grey clay. Very heavy, sandy near bottom with some gravel.
3	48 to 60	Coarse gravel, sand and clay. Well rounded stones 1/2" to 3" diameter.
4	60 to 70	Medium gravel and coarse sand. Finer gravel towards bottom.
5	70 to 92	Coarse gravel, sand and clay.
6	92 to 102	Coarse to fine gravel, sand and clay.
7	102 to 107	Clay, coarse gravel, sand.
8	107 to 123	Medium to fine gravel and sand.
9	123 to 127	Fine gravel mixed with much clay and sand.

are believed to originate from High Lake Warren and Low Lake Warren, both glacial lakes. Less continuous beach ridges 2 miles to the south, cross the Cazenovia valley at an elevation of 870 feet. These were deposited on the edge of the earlier glacial Lake Whittlesey.

(e) Recent Sediments

2.39 Postglacial processes that have modified the Cazenovia valley can be categorized as valley deepening from erosion, deposition of alluvium, and weathering of the valley sides.

2.40 Active downcutting through the bedrock shales and limestones has produced a typically rectangular valley profile with the stream flowing across exposed bedrock. The valley sides approach vertical where the river undercuts its banks. These cliffs are up to 100 feet in height. Sediment on the valley floor of the gorge section in Elma is limited to an average thickness of less than five feet of flood-deposited coarse rounded cobbles and shaly gravel in those parts of the valley not traversed by the stream during period of normal flow.

2.41 Below West Seneca, the valley widens and alluvial deposits are are thicker (estimated to be in excess of 15 feet) with a larger proportion of sand and silt. At this point, the river flows off bedrock shale and the current slackens. Finer silts and clays were observed in the bed of the river one-half mile downstream from Southgate shopping plaza. The slower current contributes to the ice jamming problems in this reach.

2.42 Slope wash material has accumulated on the valley sides in the gorge. This is generally removed when the stream undercuts its banks, but in places the accumulation of weathered bedrock and glacial drift-derived debris is up to 50 feet thick. Colluvium 48 feet and 34 feet thick occurs in the left and right valley sides, respectively, at the site for a dam considered by the Corps of Engineers in 1963. This is shown in profile on Plate 10. Much of this material has been washed into the gorge from the drift-covered valley sides above. At this location, the drift is composed of clayey till overlain by gravelly beach deposits.

2.43 Soils

2.44 Soil scientists of the U. S. Department of Agriculture Soil Conservation Service (SCS) have mapped and described 12 different soil types located within and surrounding the floodprone West Seneca portion of the study area. Soil criteria such as depth, drainage, acidity or alkalinity, texture, slope, permeability, and stoniness, and water table height are among the factors considered in these descriptions. Plate 11, derived from aerial photos supplied by the East Aurora SCS office, is a survey map for the West Seneca area. Table 10 below gives a map reference and description for each soil type.

Table 10

Soils In West Seneca Area Of Cazenovia Creek Basin

Soil Map Number	Soil Name and Description
2	Hamlin Fine Sandy Loam - moderately well to well drained, slightly acid to neutral soils formed in alluvial deposits and dominated by silts and sands. Typically free of stones and gravel in upper 40 inches and very variable below, with some areas underlain by bedrock.

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

Soil Map Number	Soil Name and Description
5	Teel Silt Loam - deep, moderately well to somewhat poorly drained, slightly acid to neutral soils formed in alluvial deposits derived mainly from limestone with some shale and sandstone influence. Coarse fragments range from 0 (most common) to 20 percent of substratum. Nearly level, found on floodplain where subject to springtime inundation. Consist of friable moderately permeable silt loam to fine sandy loam (24-40 in.) over friable, moderately permeable silt loam or fine sandy loam that may be gravelly.
7	Wayland Silt Loam - deep, poorly drained, neutral to mildly alkaline soils formed in neutral or calcareous recent alluvium. Occupy nearly level or depressed areas on floodplains receiving eroded matter from calcareous upland sources. Consist of moderately permeable silt loam or coarse silt clay loam (3-5 ft) over stratified alluvial sediment--sandy clay and gravel. Surface high in organic content.
8	Sloan Silt Loam - deep, poorly to very poorly drained, slightly acid to calcareous soils high in organic matter developed in alluvium. Occur on nearly level to depressional areas on stream floodplains. Composed of moderately permeable, coarse loam to coarse silty clay loam material.
9	Alluvium - undifferentiated soil formed in recent stream deposits with no soil condition dominant. Occupy nearby bar areas, accumulated in larger streambeds or in narrow strips along smaller streams. Permeability variable.
32	Canandaigua Silt Loam - deep, poorly or very poorly drained, slightly acid to neutral silty soils formed in calcareous glacial lake deposits. They occupy level areas or depressions. Consist of 1-1/2 to 3-1/2 feet of moderately permeable silt loam or very fine sandy loam over slightly permeable massive or platy water-sorted very fine sandy loam to coarse silty clay loam. The mucky silt loam soil consist of a silt loam surface 1-2 feet thick high in organic matter.

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

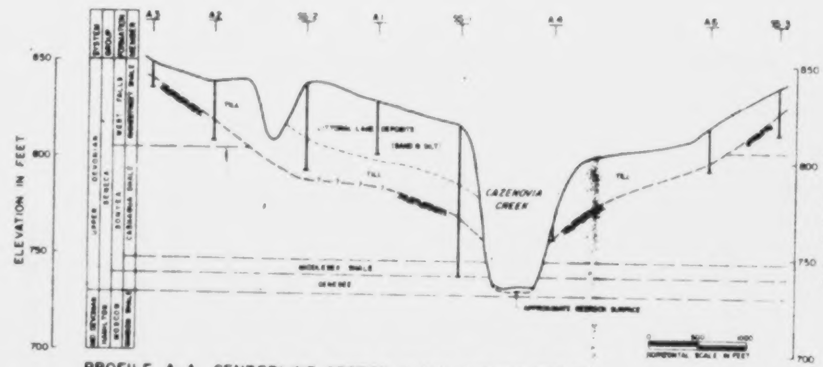
Soil Map Number	Soil Name and Description
34	Cayuga Silt Loam - deep, moderately well drained, slightly acid, developed in thin-layered lacustrine material over unsorted glacial till. Occupies undulating, rolling, and hill areas of till plains. Consist of less permeable silty clay loam on silty clay (24 to 42 in.) over medium or moderately fine textured calcareous glacial tills.
38	Collamer Silt Loam - deep, moderately well drained, strongly acid to neutral, stone-free silty soils formed in calcareous deposits of glacial lakes. Occupy gently sloping to moderately sloping topography. Consist of about 1 foot of moderately permeable silt loam over 1 to 2-1/2 feet of fine silt loam or coarse silty clay loam that is moderately permeable and is underlain by layers of silt with lenses of very fine sand and clay.
45	Niagara Silt Loam - deep, somewhat poorly drained, medium acid, silty soils developed in stratified, calcareous glacial lake deposits. Occupy nearly level to gently sloping parts of lake plains. Consist of about 1 foot of friable silt loam over 1-1/2 to 2 feet of moderately permeable silt loam material. The underlying material is friable, calcareous silt loam, with lenses of fine sand and clay.
48	Cosad Fine Sandy Loam - deep, somewhat poorly drained, strongly to slightly acid soils that formed in sandy lake sediments that overlie clayey lake-laid deposits. Typically free of stones. These nearly level to gently sloping soils are on low-lying to slightly depressional area of lake plains. Consist of 18 to 36 inches of very friable, moderately highly permeable, loamy fine sand or fine sand over very firm, very slowly permeable, calcareous silty clay loam to clay.
96	Angola Silt Loam - deep, somewhat poorly drained, neutral to moderately neutral to calcareous glacial till 20 to 40 inches over bedrock. Occupies nearly

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

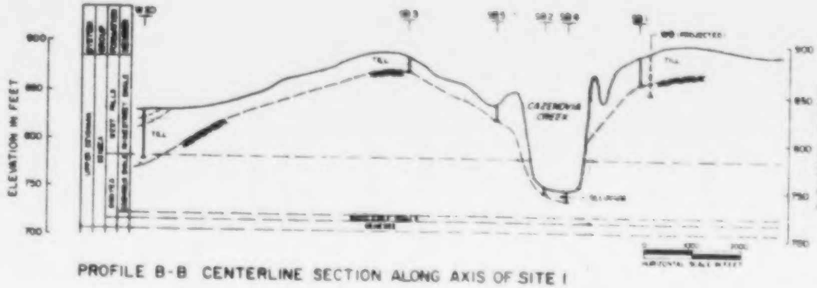
Soil Map Number	Soil Name and Description
96 (cont'd)	level to sloping areas on bedrock-controlled landforms. Consisting of moderately permeable silt loam (12 inches) very slightly permeable fine silt loam on coarse silty clay loam (12 to 14 in.) underlain by soft slightly acid or calcareous shale intergrading to hard limestone or sandstone in places.
112	Rock Outcrop - area of very shallow soils with fractured bedrock protruding above the surface in many areas.
245	Niagara Silt Loam - (substratum variant) - deep, somewhat poorly drained, medium acid, silty, developed in calcareous silty glacial lake deposits (40 to 60 in.) over glacial till. Occupies nearly level areas. Consists of friable silt loam (12 in.) over moderately permeable silt loam to silty clay loam material (18 to 24 in.). A thin layer of friable calcareous stratified silt and very fine sand to 24 inches rests on firm, dense, loamy glacial till.

2.45 Referring to the Soil Map, note that certain soil numbers are followed by a letter. The letters designate degree of slope in percent as follows: a = 0-3, b = 3-8, c = 8-15. Soil numbers lacking a slope letter are considered to be "a" slopes. Approximate depths to bedrock and seasonal water table for each soil type are listed in Table 11.


SYSTEM
GROUP
FORMATION
MEMBER
UPPER DEVONIAN
SENECA
WEST FALLS
SONYEA
CASHAQUA SHALE
HAMILTON
MOSCOW
A.3
A.2
SL.2
A.1
SL.1
A.4
A.5
SL.3
850
800
750
700
ELEVATION IN FEET
TILL
LITTORAL LAKE DEPOSITS
(SAND & SILT)
CAZENOVIA CREEK
MIDDLESEX SHALE
GENESEE
APPROXIMATE BEDROCK SURFACE
0
500
1000
HORIZONTAL SCALE IN FEET

PROFILE A-A CENTERLINE SECTION ALONG AXIS OF SITE 2

NOTES
1 BASED ON 1963 DRILLING PROGRAM BY U S CORPS OF ENGINEERS
2 BEDROCK DATA BUEHLER & TESMER (1963)
3 NO WATER TABLE OBSERVATIONS AVAILABLE


SYSTEM
GROUP
FORMATION
MEMBER
UPPER DEVONIAN
SENECA
WEST FALLS
SONYEA
900
850
800
750
700
ELEVATION IN FEET
TILL
CAZENOVIA CREEK
MIDDLESEX SHALE
GENESEE
0
1000
2000
HORIZONTAL SCALE IN FEET

PROFILE B-B CENTERLINE SECTION ALONG AXIS OF SITE I

NOTES
1 BASED ON 1967 AUGER HOLES DRILLED BY HARZA ENGINEERING CO AND WELL RECORDS
2 BEDROCK DATA FROM BUEHLER & TESMER (1963)

LEGEND

······	WATER TABLE
- - - -	BEDROCK SURFACE
—— ——	GEOLOGICAL BOUNDARY

NOTE

REFER TO PLATE 8 FOR
LOCATION OF SECTIONS

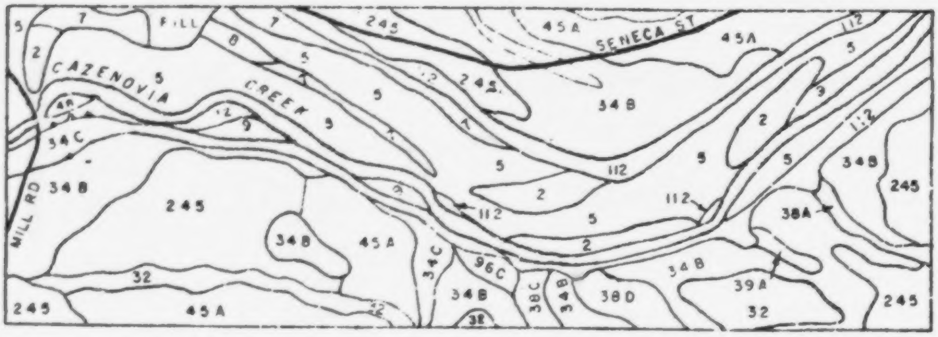
CAZENOVIA CREEK NEW YORK

VALLEY SECTIONS AT
CONSIDERED DAM SITES

U S ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 10


CAZENOVIA CREEK
SENECA ST
MILL RD
FILL
245
45A
34B
34C
38A
39A
38C
38D
96C
32
112
2
5
7
8
9

LEGEND:

2	HAMLIN FINE SANDY LOAM
5	TEEL SILT LOAM
7	WAYLAND SILT LOAM
8	SLOAN SILT LOAM
9	ALLUVIUM
32	CANANDAIGUA SILT LOAM
34	CAYUGA SILT LOAM
38	COLLAMER SILT LOAM
45	NIAGARA SILT LOAM
48	COSAD FINE SANDY LOAM
96	ANGOLA SILT LOAM
112	ROCK OUTCROP
245	NIAGARA SILT LOAM VARIANT

SLOPE DESIGNATIONS:

A	0-3 %
B	3-8 %
C	8-15 %
D	15-25%

CAZENOVIA CREEK NEW YORK

SOILS SURVEY MAP OF AREA UPSTREAM OF MILL ROAD IN WEST SENECA

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 11

Table 11

Approximate Depths To Bedrock And Seasonal Water Table

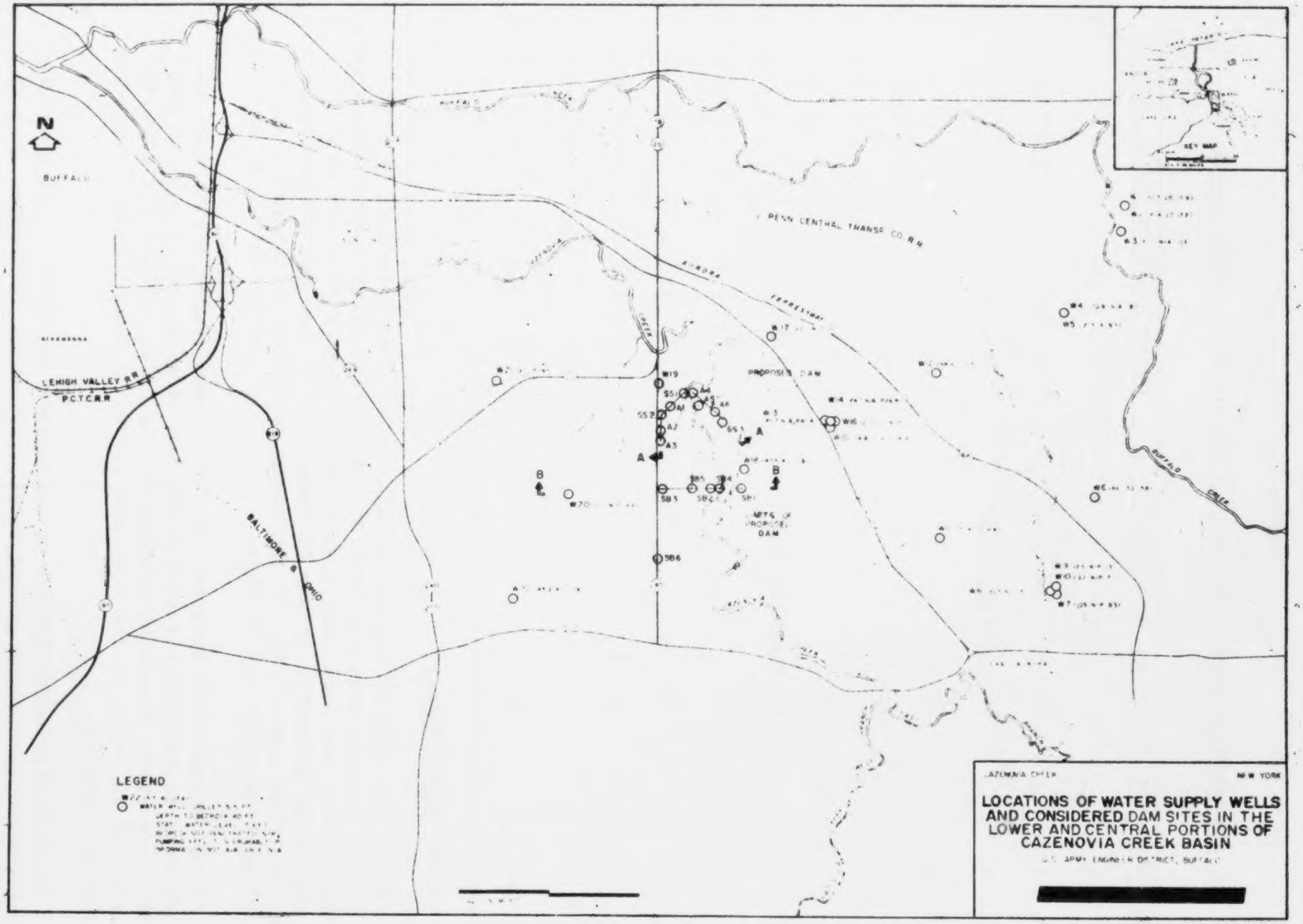
Soil Number	Depth to Bedrock, ft.	Depth to Water Table, ft.
2	3 - 3.5+	1 - 1.5+
5	5+	1 - 2
7	5+ (usually > 20)	0 - .5
8	10+	0
9	2 - 5	0 - .5
32	5+	0 - .5
38	4+ (usually > 20)	1.5 - 3
45	5+	.5 - 1.5
48	5+	.5 - 1.5
96	2 - 3	.5 - 1.5
112	0 - 1	3+
245	5+	.5 - 1.5

2.46 Water Supply

2.47 The City of Buffalo obtains water from Lake Erie through an intake located near the head of the Niagara River. West Seneca, Orchard Park, and East Aurora receive their water from the Erie County Water Authority intake in Lake Erie in the Town of Hamburg. The remaining communities in the basin currently obtain their water supplies from wells and springs.

2.48 Groundwater behavior in the unconsolidated deposits of the study area is extremely variable and has been documented by the New York State Water Resources Commission (La Sala, 1968). The borehole records of 22 wells in the area are listed in Table 12 and locations shown on Plate 12.

2.49 Static water levels in overburden and bedrock are generally less than 20 feet below ground level, indicating that water loss by


N
BUFFALO
PENN CENTRAL TRANSP CO RR
AURORA EXPRESSWAY
BUFFALO CREEK
CREEK
LEHIGH VALLEY RR
PCTCRR
BALTIMORE & OHIO
PROPOSED DAM
LIMITS OF PROPOSED DAM
W19
SS1
SS2
A1
A2
A3
A4
A5
A6
SS3
A
B
SB1
SB2
SB3
SB4
SB5
SB6
W1
W2
W3
W4
W5
W6
W7
W10
W14
W16
W17
W20
KEY MAP
LEGEND

CAZENOVIA CREEK — NEW YORK

LOCATIONS OF WATER SUPPLY WELLS AND CONSIDERED DAM SITES IN THE LOWER AND CENTRAL PORTIONS OF CAZENOVIA CREEK BASIN

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 12

Table 12

Records of Water Wells In Cazenovia Basin (From La Sala, 1968)

Well No.	Year Completed	Type of Well	Depth of Well (ft)	Diameter (in)	Depth Bedrock (ft)	Water Bearing Mat'l.	Altitude Above Sea Level (ft)	Water Level Below Land Surface (ft)	Date	Estimated Pumpage of Flow (gpd)	Remarks
1	1960	Drl	50.7	6	a 20	Shale	845	16.4	7/30/63	100	
2	1959	Drl	61.4	6	a 20	Shale	845	17.2	7/30/63	300	
3	1964	Drl	60.1	6	-	Sand	840	10.0	7/8/64	-	
4	1960	Drl	70.9	10	-	Shale	920	19.2	7/31/63	200	
5	1955	Dug	21.3	36	8	Shale	920	9.3	7/31/63	200	
6	1961	Drl	46.1	6	a 30	Shale	860	15.8	7/30/63	250	
7	1934	Drl	r105	12	-	Sand & Gravel	895	r9.5	10/14/43	250,000	Pumping rate 500 gpm. Pumping test 690 gpm, swl 9.5' dd 46.5 ft.
8	1941	Drl	r130.5	16	-	Sand & Gravel	895	r5	1/13/42	260,000	Pumping rate 430 gpm. Pumping test 700 gpm, swl 5 ft. dd 102 ft.
9	1950	Drl	r123	12	-	Sand & Gravel	895	r13	10/11/51	-	Pumping test 420 gpm, swl 13 ft. dd 16.4 ft.
10	1961	Drl	r122	12	-	Sand & Gravel	895	r7	5/16/61	250,000	Pumping rate 490 gpm

Table 12 (Cont'd)

Records of Water Wells In Cazenovia Basin (From La Sale, 1968)

Well No.	Year Com-pleted	Type of Well	Depth of Well (ft)	Dia-mater (in)	Depth Bedrock (ft)	Water Bearing Mat'l.	Altitude Above Sea Level (ft)	Water Level Below Land Surface (ft)	Date	Estimated Pumpage of Flow (gpd)	Remarks
11	1956	Drl	33.4	6	a 12	Shale	960	6.6	7/30/63	150	
12	1954	Drl	58.9	6	2	Shale	925	21.5	7/30/63	500	
13	1957	Drl	85.7	8	-	Shale	905	p40.4	9/23/63	n/a	
14	1957	Drl	24.7	12	-	Shale	910	p26.9	9/23/63	n/a	
15	1958	Drl	76.8	10	-	Shale	910	p26.9	9/23/63	n/a	
16	1962	Drl	r225	18	a 10	Shale	910	n/a	n/a	n/a	Yield 10 gpm
17	1961	Drl	22.1	6	-	Sand	830	10.5	7/26/63	250	
18	1960	Drl	43.8	6	a 40	Shale	770	17.9	7/26/63	200	Yield 3 gpm
19						No Record					
20	1959	Drl	51.5	7	-	Sand	830	9.4	7/26/63	250	
21	1959	Drl	19.7	6	a 15	Shale	740	8.5	7/26/63	250	Yield 5 gpm
22	1950	Drl	45.3	6	a 40	Sand & Gravel	830	17.9	7/26/63	100	Clay overlies water-bearing gravel

Abbreviations

dd = drawdown
swl = static water level
gpm = gallons per minute (U.S.)
Drl = drilled
r = reported
a = approximately
p = pumping effect is probable
n/a = not available

seepage from a reservoir located above Springbrook would be minimal. Overall water movements within the overburden are generally controlled by the gradient of the bedrock surface beneath, owing to the low permeability of this bedrock. A buried channel, filled with over 130 feet of coarse ice-contact deposits, north of East Aurora forms a natural groundwater reservoir from which four wells yield flows of from 500 to 800 gallons per minute (gpm); the highest yields in the Buffalo-Niagara Falls region. Recharge of these deposits from surface water is sufficient to maintain a static water level of approximately 10 feet below ground level, sufficiently high that the construction of a dam in Cazenovia valley with a crest line of up to a maximum elevation of 850 should not create seepage problems. However, if a reservoir in Cazenovia valley with an elevation greater than 800 feet were constructed, seepage through outwash deposits from this reservoir into the East Aurora groundwater reservoir could occur if induced by increased pumping from the wells north of East Aurora.

2.50 In general, permeability of sand and gravel deposits in the Buffalo-Niagara Falls area is such that six-inch wells yield from 3 to 450 gpm with yields in the 10-35 gpm range most common. In contrast, permeability of the glacial till and lake bottom sediments is so low as to yield no water to wells (La Sala, 1968).

2.51 Yields of wells in all shale formations above the Onondaga limestone are generally low, ranging from 1 gpm to about 40 gpm. The fracture zone at the bedrock surface may extend as deeply as 10 feet into the shale, in which case this horizon, combines with overlying glacial deposits (which may be coarse-grained at the base) acts as a local aquifer. The shale at this depth, therefore, has a much lower permeability than the fracture zone at the top of the shale, since vertical joints are generally only of hairline width.

2.52 The sand and gravel beach ridge deposits have a local distributive effect on groundwater, acting as near-surface drains. They are oriented at right angles to the general flow of groundwater outside the immediate influence of the Cazenovia Creek valley, and observations by the Soil Conservation Service show that a seepage line exists along the northwesterly margin of these ridges.

2.53 Water Quality In Cazenovia Creek

2.54 The most comprehensive set of data on Cazenovia Creek water quality is that assembled by the Erie County Laboratory, Public Health Division, presented in Tables 13, 14 and 15. Note these data were drawn from samples collected during the summers of 1970, 1971, and 1973, during normal working hours, with no attempt made to correlate sampling with time of day. Samples were taken during the summer months of June, July and August, and were collected approximately three times per week

Table 13

Cazenovia Creek Water Quality, West Branch

Sta. #	$BOD_{5,20}$ ppm O_2			Dissolved O_2 ppm					O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
Yr.	70	71	73	70		71	73		70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean											
CZW1	1.3	1.3	1.8	7.3	9.0	9.2	7.7	8.4	101	110	97	.04	<.005	.06	1.60	.39	401	< 2	222
CZW2	1.1	1.0	-	7.4	8.7	8.8	-	-	94	104	-	.04	.005	-	1.40	.48	508	< 2	-
CZW3	.9	1.6	-	7.8	8.6	9.8	-	-	94	116	-	.08	.07	-	2.00	.48	737	2	
CZW4	.9	1.3	-	7.9	9.1	9.9	-	-	104	106	-	.04	.005	-	1.20	.48	603	<10	-
CZW5	.9	1.3	-	8.3	9.4	10.5	-	-	107	114	-	.03	.02	-	1.20	.52	159	8	
CZW6	.9	1.4	-	8.6	9.3	9.0	-	-	102	90	-	.02	.01	-	5.80	1.40	192	< 2	

For station locations, see Plates 13, 14 and 15.

Table 14

Cazenovia Creek Water Quality, East Branch

Sta. #	$BOD_{5,20}$ ppm O_2			Dissolved O_2 ppm					O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
Yr.	70	71	73	70		71	73		70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean											
CZE1	2.2	-	-	6.5	8.8	-	-	-	98	-	-	.67	-	-	8.70	-	2591	-	144
CZE2	-	.7	-	-	-	8.8	-	-	-	104	-	-	.02	-	-	.15	-	236	-
CZE3	1.4	.7	1.5	6.0	7.2	7.8	5.0	6.6	80	90	76	.14	.02	0.10	3.00	.15	340	241	184
CZE4	.8	.7	-	7.3	8.4	10.1	-	-	88	120	-	.06	.005	-	2.90	.15	1871	90	-
CZE5	1.1	1.2	1.2	7.8	8.9	11.5	8.5	9.3	95	134	105	.07	.005	0.04	2.40	.15	229	201	577
CZE6	1.6	1.6	-	7.5	9.0	10.3	-	-	98	118	-	.08	.005	-	2.20	.41	5974	3100	-
CZE7	1.5	1.1	1.6	-	-	9.5	8.0	8.8	106	108	102	.05	.005	0.12	2.10	.39	75	75	47

For station locations, see Plates 13, 14 and 15.

Table 15

Cazenovia Creek Water Quality, Main Stream

Sta. #	$BOD_{5,20}$ ppm O_2			Dissolved O_2 ppm					O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
	Yr. 70	71	73	70		71	73		70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean											
CZ1	2.1	2.5	-	7.0	9.5	8.0	-	-	113	92	-	.22	.13	-	2.80	.55	208	-	-
CZ2	2.6	2.4	-	6.3	9.4	10.8	-	-	105	128	-	.20	.13	-	2.70	.64	338	-	-
CZ3	2.8	2.2	-	5.8	10.4	12.1	-	-	128	143	-	.29	.10	-	3.00	.82	2700	-	-
CZ4	2.1	2.6	-	7.2	10.6	9.5	-	-	131	117	-	.27	.25	-	2.40	.52	134	-	-
CZ5	3.2	4.9	1.7	7.5	11.0	-	7.3	10.3	137	-	118	.29	.60	0.17	3.30	.52	122	-	166
CZ6	1.2	2.2	-	7.4	8.9	9.5	-	-	98	108	-	.29	.70	-	3.60	1.22	1488	-	-

For station locations, see Plates 13, 14 and 15.

during 1970 summer months and on a weekly basis in 1973 summer months. Hence, although this study provides very valuable information, the results might reflect conditions occurring only during daylight hours of the summer. Effects on stream condition due to seasonal and diurnal (24 hrs.) variations were not ascertained during this study.

2.55 Parameters of water quality are discussed below in detail, followed by a review of the major biota and a summary of the creek environment in its present state. Because proposed flood control alternatives would have their greatest impact on the main stream, that reach has received the most thorough attention.

2.56 Temperature

2.57 The main stream lies in a broad channel exposed to sun and wind, even where it flows through a gorge. Because of its low flow, broad expanse, and lack of cover, the creek is assumed to be near and seldom below ambient air temperature by early afternoon. On clear sunny days, creek temperatures might possibly exceed ambient air temperatures due to surficial heating and back radiation from underlying bedrock.

2.58 Dissolved Oxygen

2.59 Dissolved oxygen (DO) is considered a primary water quality parameter, influencing the occurrence and vigor of stream life and determining the extent and degree of many complex biochemical reactions. The stauration level of O_2 in solution is inversely proportional to water temperature. The actual concentration of DO in a body of water is controlled by temperature, surface area, exposure to wind, turbulence, biological and chemical demand, and photosynthesis.

2.60 Dissolved O_2 in streams commonly ranges from 0 to 13 ppm depending on temperature, although much higher levels are possible under supersaturated conditions. The O_2 requirements of stream life vary. Some forms are capable of obtaining atmospheric O_2 and are thus independent of DO levels (although their food supply may not be). Others have developed highly efficient respiratory physiologies, enabling them to exist under low oxygen conditions (2 to 4 ppm). At the other extreme are fish such as trout, which require cold water with a dissolved O_2 content of at least 5 ppm and preferably higher.

2.61 Whatever their specific needs, most organisms are ultimately sensitive to oxygen concentration. Below limiting values, reproduction and ultimately survival are threatened. In this respect, the averaging of DO data can yield misleading results--any drop in DO below threshold limits, occurring even briefly, could kill organisms capable of living at the calculated mean levels. Benthic organisms which for the most part are either slow moving or sessile and unable to escape local conditions are especially vulnerable to O_2 minima. This point is stressed because large diurnal fluctuations in DO concentration are common in waters supporting heavy growths of algae or rooted aquatic vegetation. Here nightly DO depletion occurs due to respiratory demands no longer balanced by photosynthetic O_2 production.

2.62 Available data indicate that Cazenovia Creek is well oxygenated throughout its course, with a minimum summer daytime concentration of 5.8 ppm O_2 in the main stream. The supersaturated conditions (100%) noted along much of the creek are often indicative of quiescent flow--turbulence (as associated with a riffle area) would cause the release of excess O_2 to the atmosphere. Although data is lacking, such supersaturated conditions may be due to daytime photosynthetic O_2 production or rapid temperature changes. Although supporting information is unavailable, the relative degree of diurnal DO fluctuation can be estimated. In very shallow sections or where velocities are high enough so that streamflow direction may be discerned, nightly O_2 depletion is likely to be minimal. Much of the stream fits this description. However, in those few reaches where flow is excessively sluggish and where relatively deep pools or channels harbor luxuriant algal growths, nightly depletion might well play a major role in the local ecology. It should be emphasized that these reaches are the exception rather than the rule, and for much of the stream the prevalent open, shallow conditions favor atmospheric aeration which maintains dissolved O_2 at or above the saturation level.

2.63 Organic Matter and Oxygen Demand

2.64 Organic matter may originate in a stream (remains of plant and animal life) or enter it from outside (sewage effluents, overhanging vegetation, etc.). High concentrations of organic matter support rich growths of microbial life which depletes the stream's supply of dissolved O_2. The Biochemical Oxygen Demand (BOD) is a measure of the organic matter assimilable by stream organisms. BOD is conventionally expressed in terms of milligrams per liter (mg/l) O_2 utilized over a five-day period by microorganisms in a sample of water incubated in the dark at some standard temperature (usually 20° C). "Pure" natural waters exhibit BOD's of up to 5 mg/l, while raw sewage effluents often exhibit BOD's as high as 300 mg/l (Mackenthun, 1969).

2.65 BOD values at points along Cazenovia Creek are given in Tables 13, 14 and 15. During the sampling period, the BOD did not exceed 5 mg/l anywhere, even near the hamlets of Holland and West Falls, where small sewage treatment plants discharge into the stream (refer to Table 16 for a complete listing of effluent contributors). Organic loading is not a serious problem on Cazenovia Creek at the present time, although it could quickly become one as creek frontage is encroached upon by residential and commercial development. The creek ecosystem has the capacity to degrade, assimilate, and disperse existing organic loads within a short diatance from their source.

2.66 Dissolved Inorganic Matter and pH

2.67 An extensive survey of the inorganic chemistry of area streams, a portion of which is reproduced herein, was published in 1968 by the Erie-Niagara Basin Regional Water Resources Planning Board. Results of water quality analyses for Cazenovia Creek, completed through a range of discharge conditions, are tabulated in Table 17. Table 18 explains the significance of the individual substances and gives, where applicable, the maximum allowable according to Federal drinking water standards. Referencing data to streamflow as done here is critical. During periods of low flow, the creek contains predominantly groundwater which has percolated through soil and rock layers, leaching out soluble components. Under high flow conditions this mineralized water is diluted by overland runoff, an effect dramatically illustrated in this study.

2.68 The dominant chemical characteristics of Cazenovia Creek water in 1968 were hardness, alkaline pH (greater than 7.0) and moderate mineral content (dissolved soilds). These characteristics reflect the calcareous nature of the bedrock in the stream basin. It is therefore unlikely that the chemical characteristics have changed much during the six-year interim, or will in the foreseeable future. The effect of urbanization in the basin on other chemical parameters is unknown, except for chlorides, which were sampled very near the 1968 study sites in 1970 and 1971 by the Erie County Public Health Division. Comparison of the results in Table 19, reveals a marked upward trend in chloride concentration over the years. These increases could be due to a number of factors including salt runoff from highway deicing operations and industrial or municipal discharges, but at present speculation would be premature.

Table 16

Sanitary Discharges Into Cazenovia Creek

Miles from Mouth	Town or Village	Nature or Source of Discharge	Miles from Confluence of E. & W. Branches	Town or Village	Nature or Source of Discharge
	Main Stream			East Branch	
7.2	W. Seneca	W. Seneca State School untreated	1.2	E. Aurora	E. Aurora Sewage Treatment Plant
11.2	Elma	Moog Valve Plant disch.	5.6	Aurora	Aurora Trailer Court
15.6	Aurora	St. John Vianney Seminary	8.3	Aurora	Gow School
			9.0	Wales	Creekside Trailer Court
	Tannery Brook		13.4	Holland	
3.9	Wales	Circle Cts. (apts.)	13.7	Holland	Holland Central School
			14.1	Holland	Town Sewage Treatment Plant
				West Branch	
			5.6	W. Falls	Town Treatment Plant
			10.5	Colden	
			13.0	Glenwood	
			14.0	Glenwood	Glenwood Acres Disch.
			14.0	Concord	Craneridge Subdivision
			14.2	Concord	Kissing Bridge Disch.

Table 17

Inorganic Chemistry of Cazenovia Creek

Source: Erie-Niagara Basin Chemical Quality of Streams (1968)
By Erie-Niagara Basin Regional Water Resurces Planning Board

Location → / Parameter ↓	Main Stream At Ebenezer Gauge					East Branch South Wales			West Branch East Aurora		
Instantaneous Discharge cfs	24	31	81	10	158	29	5.3	83	42	4.9	--
Silica (SiO_2)	2.6	3.6	.3	3.9	--	1.9	6.3	--	.7	3.8	--
Iron (Fe)	.07	.15	.11	.06	.12	.05	.03	.08	.03	.16	.05
Manganese (Mn)	--	0	0	.02	.07	0	0	.16	0	.02	.03
Calcium (Ca)	42	51	46	58	36	36	45	27	36	49	28
Magnesium (Mg)	10	11	9.2	11	6.4	7.5	8.0	5.6	6.6	9.1	5.0
Sodium (Na)	15	13	19	28	12	6.0	7.1	5.4	6.1	8.7	5.1
Potassium (K)	2.0	3.1	2.0	3.5	1.4	1.3	1.8	1.2	1.5	2.2	1.2
Bicarbonate (HCO_3)	104	135	120	111	88	100	131	72	92	124	70
Sulfate (SO_4)	51	58	47	69	36	34	38	28	39	60	30

Table 17 (Cont'd)

Inorganic Chemistry of Cazenovia Creek

Location → Parameter ↓	Main Stream At Ebenezer Gauge					East Branch South Wales			West Branch East Aurora		
Instantaneous Discharge cfs	24	31	81	10	158	29	5.3	83	42	4.9	--
Chloride (Cl)	28	20	32	48	20	11	12	9.1	12	14	9.0
Fluoride (F)	.2	.1	.1	.1	--	1.0	0	--	.1	.1	--
Dissolved Solids at 180°C	234	235	220	796	181	154	199	127	153	214	129
Hardness Ca, Mg as $CaCO_3$	146	173	153	190	116	121	146	90	117	160	90
Non-Carbonate	60	62	55	72	44	39	38	32	42	59	33
Specific Conductance umphos at 25°C	362	395	398	491	293	273	330	214	267	352	213
pH (units)	7.3	8.2	8.0	8.8	7.9	7.8	7.3	8.1	7.6	7.6	8.0
Alkyl Benzene Sulfonate (PBS)	--	--	0	.1	--	0	0	--	0	0	--

Note: All units ppm unless otherwise stated.

Table 18

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Source: Erie-Niagara Basin Chemical Quality of Streams (1968) - E-NBRWRPB

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Alkyl benzene sulfonate (ABS)	Synthetic detergents in domestic, and industrial wastes.	Causes tastes and odors, and causes foam on streams and in treatment plants. Treatment somewhat difficult and generally incomplete.	0.0-.4	0.0-.2	0.5
Bicarbonate (HCO_3) Carbonate (CO_3)	Action of carbon dioxide in water on carbonate cementing material and rocks, such as limestone and dolomite.	Produces alkalinity. On heating in the presence of calcium and magnesium can form scales in pipes and release corrosive carbon dioxide gas. Aid in coagulation for the removal of suspended matter from water.	HCO_3 91-180 CO_3 0	150-230 0	—
Calcium (Ca), Magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum.	Causes most of the hardness and scale-forming properties of water; detergent consuming (see hardness). Water low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing. Small amounts desirable to prevent corrosion.	Ca 32-58 Mg 6-12	58-160 11-22	—
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and industrial wastes.	Some people can detect salty taste in concentrations exceeding 100 ppm. Large quantities increases the corrosiveness of water. Present available treatment methods not generally economical for most uses.	6-22	19-71	250

Table 17 (Cont'd)

Inorganic Chemistry of Cazenovia Creek

Location → Parameter ↓	Main Stream At Ebenezer Gauge					East Branch South Wales			West Branch East Aurora		
Instantaneous Discharge cfs	24	31	81	10	158	29	5.3	83	42	4.9	--
Chloride (Cl)	28	20	32	48	20	11	12	9.1	12	14	9.0
Fluoride (F)	.2	.1	.1	.1	--	1.0	0	--	.1	.1	--
Dissolved Solids at 180°C	234	235	220	796	181	154	199	127	153	214	129
Hardness Ca, Mg as $CaCO_3$	146	173	153	190	116	121	146	90	117	160	90
Non-Carbonate	60	62	55	72	44	39	38	32	42	59	33
Specific Conductance umphos at 25°C	362	395	398	491	293	273	330	214	267	352	213
pH (units)	7.3	8.2	8.0	8.8	7.9	7.8	7.3	8.1	7.6	7.6	8.0
Alkyl Benzene Sulfonate (PBS)	--	--	0	.1	--	0	0	--	0	0	--

Note: All units ppm unless otherwise stated.

Table 18

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Source: Erie-Niagara Basin Chemical Quality of Streams (1968) - E-NBRWRPB

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Alkyl benzene sulfonate (ABS)	Synthetic detergents in domestic, and industrial wastes.	Causes tastes and odors, and causes foam on streams and in treatment plants. Treatment somewhat difficult and generally incomplete.	0.0-.4	0.0-.2	0.5
Bicarbonate (HCO_3) Carbonate (CO_3)	Action of carbon dioxide in water on carbonate cementing material and rocks, such as limestone and dolomite.	Produces alkalinity. On heating in the presence of calcium and magnesium can form scales in pipes and release corrosive carbon dioxide gas. Aid in coagulation for the removal of suspended matter from water.	HCO_3 91-180 CO_3 0	150-230 0	—
Calcium (Ca), Magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum.	Causes most of the hardness and scale-forming properties of water; detergent consuming (see hardness). Water low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing. Small amounts desirable to prevent corrosion.	Ca 32-58 Mg 6-12	58-160 11-22	—
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and industrial wastes.	Some people can detect salty taste in concentrations exceeding 100 ppm. Large quantities increases the corrosiveness of water. Present available treatment methods not generally economical for most uses.	6-22	19-71	250

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards'1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Color	Decaying vegetation; peat, leaves, roots and other organic substances, industrial wastes and sewage and certain minerals.	Water for domestic and some industrial uses should be free from perceptible color. Color in water is objectionable in food and beverage processing and many manufacturing processes.	3-9	6-26	--
Dissolved Solids (residue on evaporation)	Chiefly mineral constituents dissolved from rocks and soils. Includes some water of crystallization.	Waters containing more than 1,000 ppm of dissolved solids are unsuitable for many purposes.	140-240	260-720	500
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils. Added to many waters by fluoridation of public supplies.	Fluoride concentrations between 0.8 and 1.5 ppm accepted as range for beneficial effect on the structure and resistance to decay of children's teeth in study area as based on the average annual daily maximum temperature of 56.3°F at Buffalo (Johnson, 1960, p.11). Fluoride in excess of 6.0 ppm causes pronounced mottling and disfiguration of teeth.	0.0-.2	0.2-.4	--
Hardness as $CaCO_3$	In most waters nearly all hardness due to calcium and magnesium.	Consumes soap and synthetic detergents. Although less of a factor with synthetic detergents than with soap, it is still economical to soften hard waters (Aultman, 1958).	100-190	190-490	--

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Hydrogen ion, concentration (pH)	Hydrogen ion concentration	A pH of 7.0 indicates neutrality of a solution. Values higher than 7.0 denote increased alkalinity; values higher than 7.0 indicate increased acidity. Corrosiveness of water generally increased with decreasing pH, but excessively alkaline waters may also attack metals.	7.3-8.1	7.2-8.0	—
Iron (Fe)	Dissolved from practically all rocks and soils. Found in some industrial wastes. Can be corroded from iron pipes, pumps and other equipment.	More than 0.1 ppm often precipitates on exposure to air, causing turbidity, staining and tastes and colors which are objectionable in food, beverage, textile processes and ice manufacturers as well as the cause of problems in domestic use such as staining plumbing fixtures and laundry.	0.03-.19	0.05-.19	0.3
Manganese (Mn)	Dissolved from some rocks, soils, and lake bottom sediments. Sources associated with that of Iron.	Same objectionable features as Iron. Causes dark brown or black stains. Manganese removal associated with that of Iron but more difficult and generally less complete.	0.00-.03	0.01-.17	.05
Nitrate (NO_3)	Decaying organic matter, sewage, fertilizers and nitrates in soils.	Small amounts of nitrate help reduce cracking of high-pressure boiler steel. It encourages growth of algae and other organisms which produce undesirable taste and odors. Concentrations in excess of 45 ppm limit are suspected as cause of methemoglobinemia in infants.	0.4-4.6	0.6-3.5	45

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Silica (SiO_2)	Dissolved from practically all rocks and soils.	Together with calcium and magnesium, silica forms a low-heat conducting hard glassy scale in boilers and turbines. Silica inhibits deterioration of zeolite-type water softeners and corrosion of iron pipes by soft water.	1-6	1-7	--
Sodium (Na), Potassium (K)	Dissolved from practically all rocks and soils. Found in industrial wastes and sewage.	More than 50 ppm sodium and potassium in the presence of suspended matter causes foam in boilers which accelerates scale formation and corrosion. More than 65 ppm of sodium can cause problems in ice manufacture. (Durfor and Becker, 1964a, p. 17)	Na 3-12 K 1-3	9-30 2-4	--
Specific Conductance	Mineral content of the water.	Guide to mineral content. It is a measure of the capacity of the water to conduct a current of electricity, and varies with the concentration and degree of ionization of the different minerals in solution.	230-420	420-1,000	--
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, sulfides, and other sulfur compounds. May be derived from industrial wastes, both liquid and atmospheric.	Sulfate in water containing calcium forms hard scale in steam boilers. In large amounts, sulfate in combination with other ions gives bitter taste to water. Some calcium sulfate is considered beneficial in brewing processes.	22-55	40-350	250

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Turbidity	Suspended and colloidal matter. Sources can be soil erosion, industrial wastes, micro-organisms.	Turbid water aesthetically objectionable. Also, objectionable in many industrial processes; generally removed by sedimentation, clarification or filtration.	0.0-.7	0.2-.7	--

1/ U.S. Public Health Service (1962).

Table 19

Chloride Concentration in Cazenovia Creek, PPM

Location	1968			1970			1971		
	max	min	mean	max	min	mean	max	min	mean
Main Stream	48	20	30	300	10	102	NA	NA	150
E. Branch	12	9	11	23	8	18	NA	NA	100
W. Branch	14	9	12	73	8	26	NA	NA	75

2.69 Nitrates and Phosphates

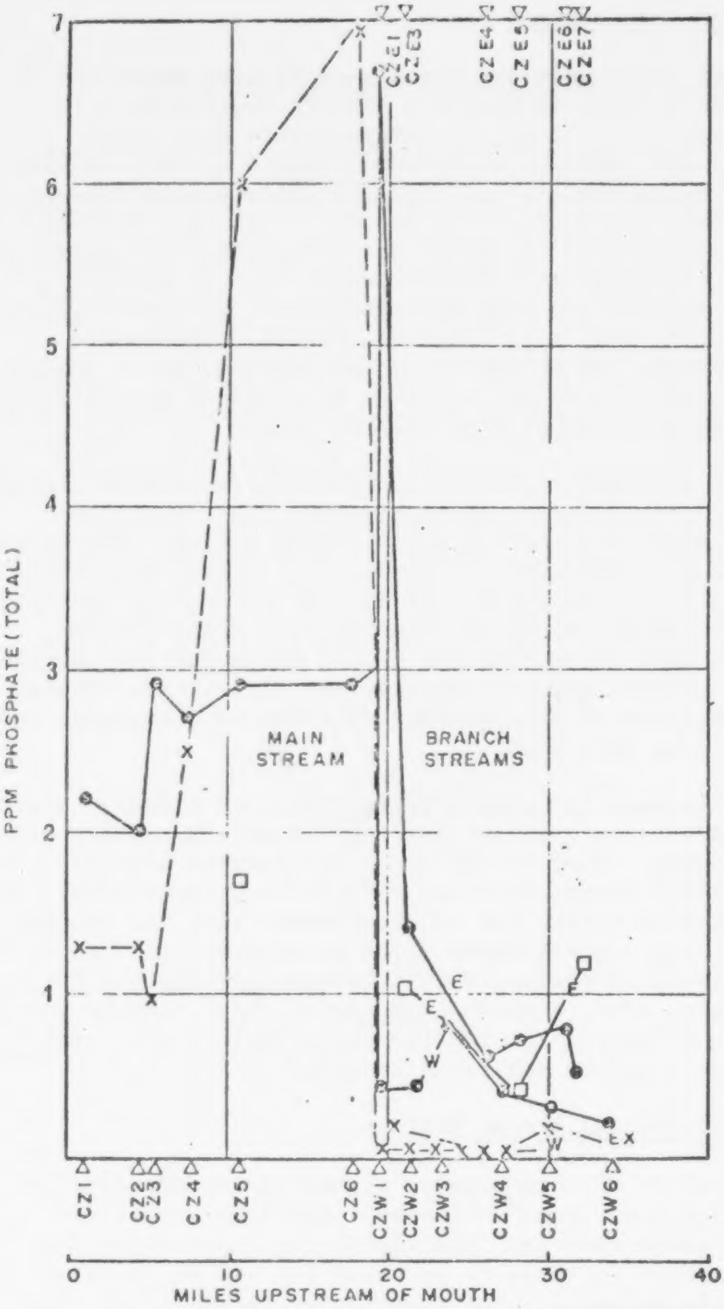
2.70 Nitrates and phosphates are usually considered among the most critical nutrient substances entering aquatic ecosystems. In many cases, the concentration of nitrate or phosphate determines primary productivity, the capacity of an ecosystem to convert radiant energy and inorganic substances into living protoplasm (biomass). Under proper conditions, nutrient levels as low as 0.2 mg/1 nitrate and 0.01 mg/1 phosphate promote luxuriant growths of producer organisms (photosynthetic algae and macrophytes) which in turn support large populations of grazing and predatory organisms (MacKenthum, Ruttner). Note, however, that regardless of nitrate or phosphate level, if other conditions (water velocity, temperature, metal ion levels, etc.) are unfavorable to the survival of producer populations, they will not flourish and productivity will be low.

2.71 Much of the drainage basin for Cazenovia Creek system consists of woodland and agricultural land. It is possible that fertilizer enriched runoff from some of these lands and sewage effluent discharges may contribute to the nutrient content in the creek. Available water quality data (Tables 13, 14 and 15; Plates 13 and 14) seem to indicate a marked decrease in phosphates and nitrates between study periods. However, as discussed in the intorduction to the Water Quality section these data might not reflect seasonal and diurnal variations. Therefore, a meaningful analysis of the apparent decrease in phosphates and nitrates is impossible at this time.

2.72 The available data do suggest certain general trends, however, the main stream appears to be the most nutrient-laden branch, especially with respect to phosphate. Most of the creek experiences nitrate concentrations well above limits critical to primary productivity. It is quite possible these nutrients are underutilized; that due to physical or geological shortcomings (shallowness, poor substrate), the creek is unable to support a level of productivity otherwise sustainable by ambient nutrient levels. This consideration is of prime concern in the assessment of any flood control alternative which would create conditions more favorable to algal growth, such as a reservoir.

2.73 Sanitary Quality and Stream Rating

2.74 Sanitary quality of stream water is most often measured by determining the abundance of fecal coliforms - bacteria associated with feces of warm-blooded mammals. Mean fecal coliform counts in Cazenovia Creek, expressed in terms of bacteria per 100 ml of water are given in Tables 13, 14 and 15, and graphically in Plate 15. The U.S. Department of Health states that waters with suitably determined mean fecal coliform counts of greater than 1 per ml are unfit for human consumption, while the U.S. Department of the Interior states

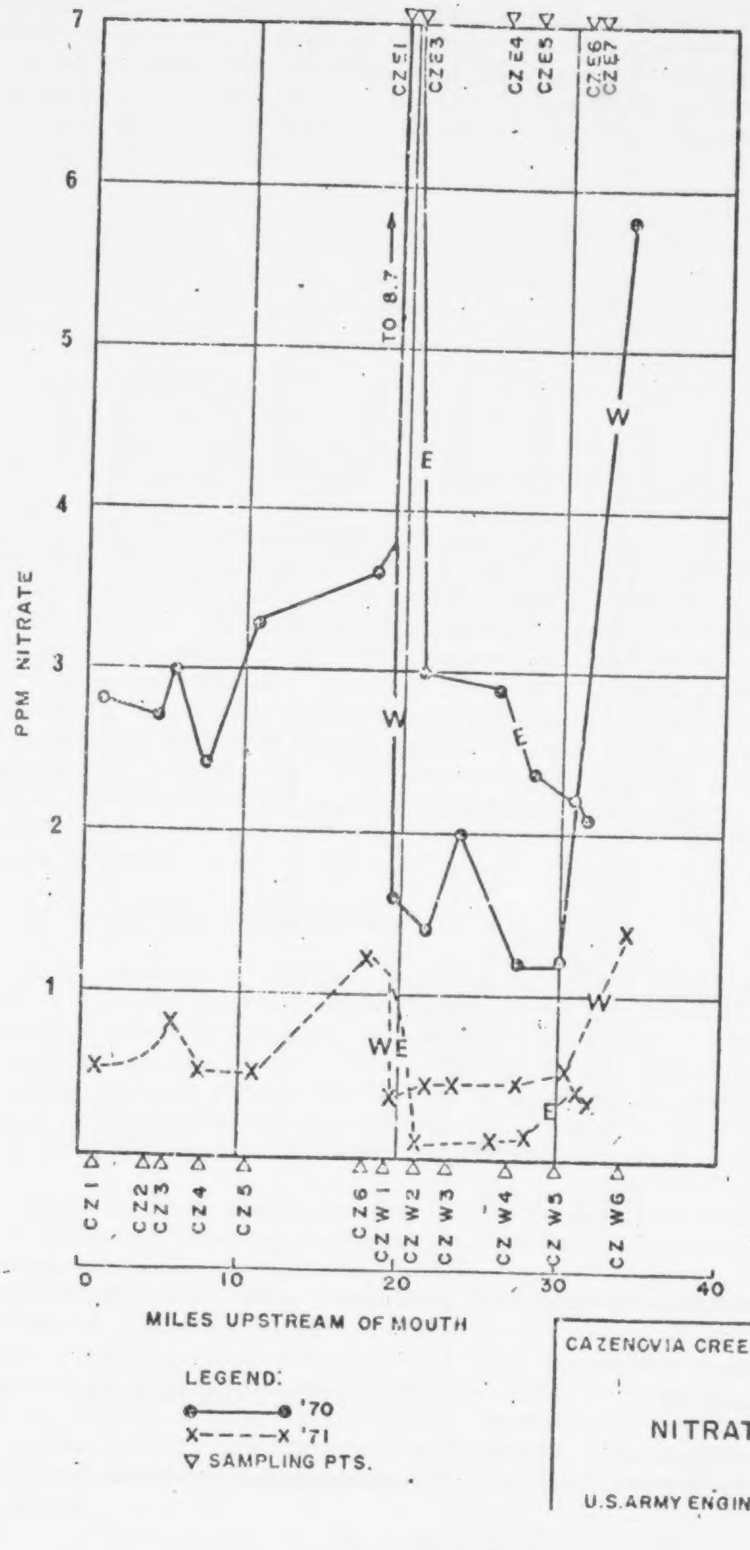


CAZENOVIA CREEK NEW YORK

PHOSPHATE LEVELS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 13

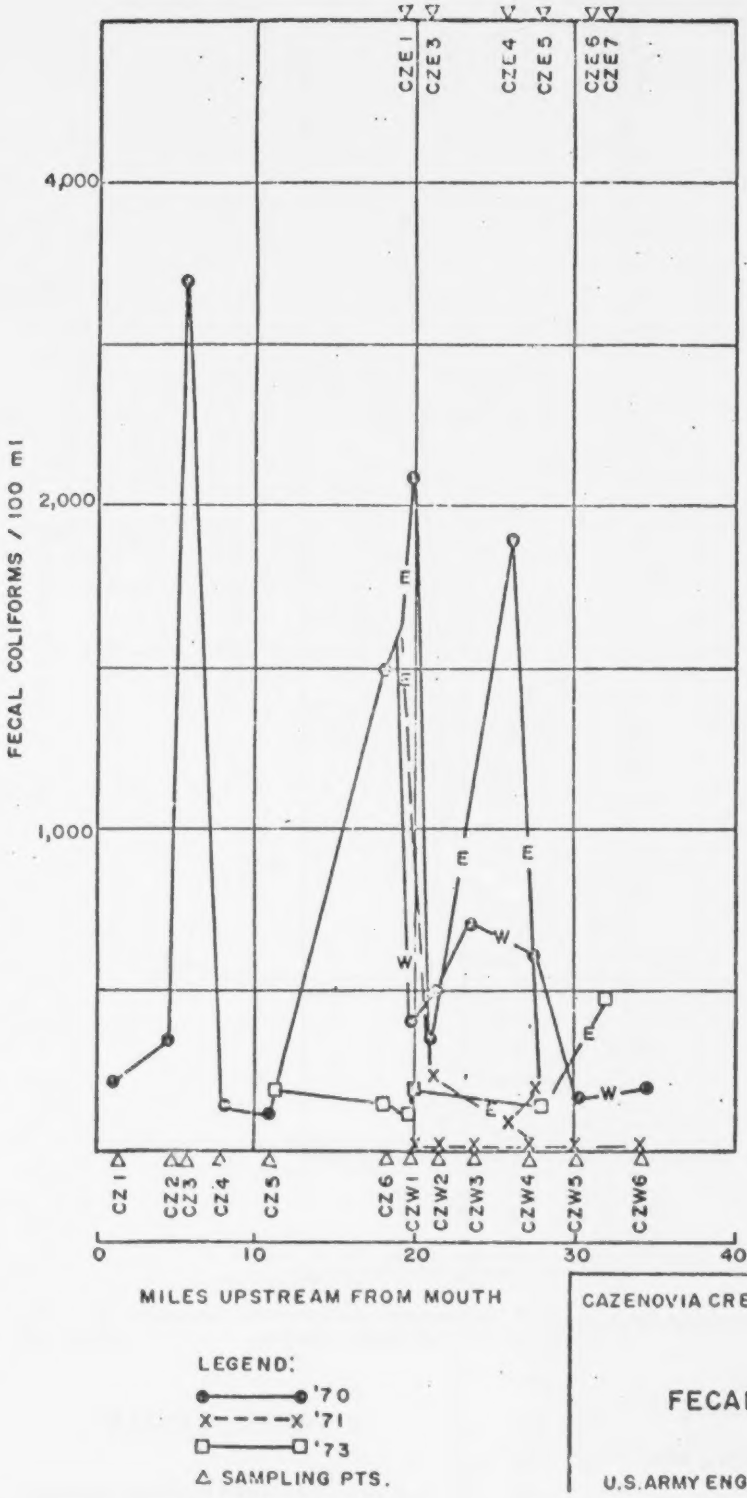


CAZENOVIA CREEK NEW YORK

NITRATE LEVELS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 14



CAZENOVIA CREEK NEW YORK

FECAL COLIFORMS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 15

that waters with greater than 200 per 100 ml are unfit for extensive body contact. According to these standards, Cazenovia Creek is largely unsuitable even for swimming despite a New York State Classification as a B stream (bathing permitted) throughout much of its length. Note, however, that New York State standards do not consider coliform content in determining a Class B rating.

2.75 The sanitary quality of Cazenovia Creek is much higher than some local public beaches and equal to that of the Niagara River at Beaver Island State Park, one of the most popular beaches in the area. Mean coliform counts on Cazenovia Creek during 1973 were 242 as compared to 237 at Beaver Island.

2.76 Stream Biota

2.77 Aquatic Plant Life

2.78 Available data on the aquatic plant life of Cazenovia Creek is rather sparse. The 1973 Erie County Stream Survey, by the Erie County Dept. of Health, conducted from 19 June to 3 October 1973, notes the more common plants observed in Ellicott Creek during their intensive water quality study. The bottom of Cazenovia Creek varies from sand, gravel, and large stones to clay and some humus. Few deposits of muck or organic debris were noted. Totally submerged aquatic plants included (Elodea canadensis and Myriophyllum heterophyllum). Seen floating on the water surface were Duckweek (Lemna minor). A frequent emergent was Arrowhead (Sagittaria latifolia). Filamentous algae include Cladophora, dominant at all stations and Spriogyra, Hydrodictyon, Zygnema, and Mougeoteria. Diatoms observed at the Center Street Bridge in Aurora were Cymbella and Navicular.

2.79 Benthic Invertebrates

2.80 Benthic or bottom-dwelling organisms constitute an integral part of the stream food chain. Many, such as mayfly nymphs, are primary consumers feeding directly on aquatic plant life. Some, including a variety of larval insect forms, are secondary consumers, carnivores actively preying upon other animal life. Others such as the pollution-tolerant Tubifex worms are detritovores, grazing on bacteria associated with decaying organic debris.

2.81 Benthic invertebrates of Cazenovia Creek are listed in Table 20 in order of abundance, based upon collections gathered by the Sanitary Biology section of the County Public Health Division during the summers of 1970, 1971 and 1973. Note that Tendipes is a dominant organism in all reaches of the stream, reflecting its tolerance of a wide range of conditions. Tubifex worms are abundant only in highly restricted locales immediately downstream of sewage effluents. Even here, however, forms such as mayfly nymphs with high O_2 requirements are common, indicating the effectiveness of atmospheric aeration. The main stream community appears dominated by organisms favoring pool rather than stream habitats.

2.82 Little information is available concerning the benthic microfauna of Cazenovia Creek. Large populations of sessile rotifers and protozoans are to be expected wherever benthic algae occur. It is impossible here to assess the impact of this community on overall stream metabolism. Certainly, the nutrient supply is more than adequate, and the physiographic characteristics which limit larger forms would have little effect on these microscopic organisms.

2.83 Fish

2.84 Fish inhabiting Cazenovia Creek are of interest to local residents as a potential source of recreational pleasure. However, the creek in its present natural state is a poor source of game and pan fish. Surveys taken during the summers of 1956 and 1967 by N.Y.S. Dept. of Environmental Conservation personnel of the Scottsville, NY, office reveal that of the 20 odd species of fish in the main stream, 10 are minnows. Of these, by far the most abundant are the common shiner (Notropis cornutus) and the stoneroller (Campostoma anomalum). The most numerous large fish are the suckers Hypentelium nigricans and Catostomus commersoni. The highly desirable Centrarchids (bass, sunfish, etc.) are found sporadically, while trout are found only in the upper East Branch above Holland. Table 21 lists fish species known to inhabit Cazenovia Creek below the confluence of the East and West Branches. No endangered fish species are known to inhabit Cazenovia Creek.

2.85 In a 1967 study of fish and wildlife in the Erie-Niagara Basin, the State Department of Environmental Conservation (DEC) characterized Cazenovia Creek as a low-potential fishery resource. Public access is limited due to extensive posting. Furthermore, the DEC concluded that cold-water game fish such as trout are limited by high temperature, unsuitable streambed, and lack of cover; while warm-water fish such as bass are limited by extreme overall shallowness and concomitant absence of large deep pools.

2.86 Terrestrial Biota

2.87 Vegetation

2.88 Along Cazenovia Creek, wherever soil is adequate and man's interference is minimal, a natural eastern deciduous forest has evolved. The species growing in abundance alongside the streams, such as black willow, American sycamore, and eastern cottonwood, reflect the alluvial nature of the soils. On the lower slopes of the Cazenovia valley, a yellow birch-American beech-sugar maple association has developed, while the upper slopes support an oak-hickory climax forest, reflecting the dry, excessively drained conditions. Beyond the valley proper, the land is flat and intensely cultivated. A comprehensive listing of vegetation found in Cazenovia basin is given in Table 22.

2.89 Much of the natural vegetation in West Seneca and Buffalo has been sacrificed during residential and commercial development. Floodplain

Table 20

Benthic Invertebrates Inhabiting Cazenovia Creek

Listed in order of decreasing abundance for each reach.

East Branch

Mayfly nymphs
Tendipes (midge) larvae
Caddisfly larvae
Psephenus (waterpenny) larvae
Pentaneura larvae
Elmid beetle larvae
Tubifex worms
Stonefly nymphs
Physa (snail)
Amylus (limpet)
Watermites
Tabanid larvae
Ceratopogonoid (gnat) larvae
Goniobasis (snail)
Gammarus (amphipod)
Leeches

West Branch

Tendipes larvae
Mayfly nymphs
Ceratopogonid larvae
Pentaneura larvae
Simulium (blackfly) larvae
Cranefly larvae
Psephenus larvae
Stonefly larvae
Cyclops

Main Stream

Tendipes larvae
Leeches
Pentaneura larvae
Tubifex worms
Psephenus larvae
Elmid larvae
Physa
Amylus
Simulium larvae

Table 21

Fish Inhabiting the Main Stream of Cazenovia Creek

Generic Name	Common Name
Cyprinidae (minnowlike fish)	
Notropis cornutus	common shiner
Notropis sp.	shiner
Rhinichthys cataractae	longnose dace
Rhinichthys atratulus	blacknose dace
Semotilus atromaculatus	creek chub
Nocomis biguttata	hornyhead chub
Nocomis micropogon	river chub
Campostoma anomalum	stoneroller
Cyprinus carpio	carp
Pimephales notatus	bluntnose minnow
Catostomidae (suckers)	
Hypentelium nigricans	northern hogsucker
Catostomus commersoni	white sucker
Percidae (darters)	
Etheostoma blennioides	greenside darter
Etheostoma caeruleum	rainbow darter
Centrarchidae (bass & sunfish)	
Lepomis gibbosus	pumpkinseed
Amblopites rupestris	rockbass
Micropterus salmoides	largemouth bass
Micropterus dolomieui	smallmouth bass
Ictaluridae (catfish)	
Ictalurus nebulosus	brown bullhead
Noturus flavus	stonecat

Table 22

Cazenovia Creek Basin Vegetation*

Trees

Scientific Name	Common Name
Salix nigra	black willow
Fagus grandiflora	American beech
Acer saccharum	sugar maple
Tusga canadensis	eastern hemlock
Betula lenta	grey birch
Ostrya virginiana	ironwood
Carpinus caroliniana	blue beech
Acer rubrum	red maple
Quercus alba	white oak
Quercus borealis	northern oak
Prunus pennsylvanicus	pin cherry
Populus tremuloides	quaking aspen
Populus grandidentata	bigtooth aspen
Populus deltoides	eastern cottonwood
Rhus typhina	staghorn sumac
Betula alleghaniesis	yellow birch
Ulmus americana	American elm
Ulmus rubra	slippery elm
Ulmus thomasii	rock elm
Pinus strobus	white pine
Juglans cinerea	butternut
Juglans nigra	black walnut
Carya ovata	shagbark hickory
Carya glabra	pigut hickory
Amelanchier laevis	serviceberry
Amelanchier canadensis	shadbush
Fraxinus americana	white ash
Tilia americana	basswood
Platanus occidentalis	sycamore
Liriodendron tulipifera	tulup poplar
Acer negundo	boxelder

Shrubs

Scientific Name	Common Name
Prunus virginiana	choke cherry
Hamamelis virginiana	witch hazel
Taxus canadensis	yew
Vibernum acerifolium	mapleleaf viburnum
Cornus stolonifera	red-osier dogwood
Cornus paniculuta	dogwood sp.

* Various sources used in compilation of this table, but mainly from Zenkert (1934).

Table 22 (Cont'd)

Cazenovia Creek Basin Vegetation*

Shrubs

Scientific Name	Common Name
Sambucus racemosa	elderberry sp.
Rubus allegheniensis	blackberry sp.
Rubus occidentalis	blackberry sp.
Rubus odoratus	blackberry sp.
Salix cordata	willow sp.
Salix longifolia	willow sp.
Cornus rugosa	dogwood sp.
Crataegus punctata	hawthorn sp.
Crataegus roanenses	hawthorn sp.
Crataegus pringlei	hawthorn sp.
Sambucus canadensis	american elderberry
Euonymus obovatus	wahoo
Lonicera canadensis	honeysuckle
Ribes americanum	gooseberry sp.
Ribes cynosbati	gooseberry sp.

Herbaceous Plants

Agropyron repens	quackgrass
Cichorum intypus	chicory
Trifolium repens	white clover
Phleum pratens	timothy
Daucus carota	wild carrot
Melilotus albus	white sweet clover
Melilotus officinalis	yellow sweet clover
Dipsacus sylvestris	teasel
Convolvulus sepium	hedge bindweed
Plantago lanceolata	buckhorn plantain
Solanum dulcamara	bittersweet nightsha
Hypericum perforatum	St. Johnswart
Dactylis glomerata	orchardgrass
Fragaria virginiana	wild strawberry
Sonchus oleraceus	common sowthistle
Ambrosia artemissifolia	ragweed
Taraxacum officinale	dandelion
Rumex crispus	curly dock
Poa sp.	bluegrass
Solilago sp.	goldenrod
Brasica sp.	wild mustard
Arctium minus	burdock
Impatiens pallida	jewelweed
Vitus sp.	wild grape

development has been extensive and along many reaches, streambank vegetation has been entirely removed. Immediately downstream from West Seneca, the creek flows through Cazenovia Park, a 192-acre recreational area where many fine trees of various species are preserved.

2.90 The greatest flood damages in the study area occur in West Seneca in the vicinity of the Union Road bridge. Although much of the area has been developed for commercial and residential uses, many large trees remain. In the reach between Ridge and Leydecker Roads, many magnificent specimens can be found, some exceeding 100 feet in height and 3 feet in diameter. Some trees have been severely damaged by ice floes. The dominant overstory species here are eastern cottonwood and blackwillow, with an understory of boxelder, ironwood, shrub willow, and other woody shrubs. Common groundcover species are chicory, wild carrot, dandelion, burdock, and wild grape. A vegetation and land use map for this area is shown on Plate 16. Plate 17 gives a reference map of the area (see Section 2.132).

2.91 Wildlife

2.92 Some 45 species of mammals occur in the Western New York region according to Hamilton (1943). These are listed in Table 23. It is probable that many of these now occur infrequently or sporadically. Near the major flood damage area in West Seneca, species most likely to be found include various mice, chipmunks, squirrels, and the eastern cottontail rabbit.

2.93 Amphibians and reptiles known to inhabit the Erie-Niagara Region and which might be expected in the Cazenovia basin are listed in Table 24. This information was adapted from "Amphibians and Reptiles of Western New York" by Willard F. Stanley of the State University College at Fredonia, NY.

2.94 Cazenovia basin is an excellent area for birds. Surveys by the Buffalo Ornithological Society (Beardslee and Mitchell, 1965), indicate that some 384 different species occur in the Buffalo area. Of these, some are non-migratory, others are noted only during the summer or winter, and still others are seen only during their migration through the area. A very general classification of the birds occurring in this region is given as follows:

Permanent Residents	24 species
Introduced Permanent Residents	8 species
Summer Residents	118 species
Summer Visitants	3 species
Winter Visitants	38 species
Transient Visitants	114 species
Introduce Rare Transient Visitants	1 species
Rare and Very Rare Visitants	10 species
Casual and Sporadic Visitants	24 species
Accidental Visitants	44 species

Table 23

Mammals Known to Have Occurred in Western New York

Scientific Name	Common Name
Didelphis virginiana	opossum
Parascalops breweri	hairy-taled mole
Condylura cristata	star-nosed mole
Sorex cinereus	common shrew
Sorex fumeus	smoky shrew
Microsorex hoyi	pigmy shrew
Cryptotis parva	short-tailed shrew
Blarina brevicanda	meadow shrew
Myotis lucifugus	little brown bat
Myotis keenii	Say's bat
Myotis sodalis	Indiana bat
Lasionycteris noctivagans	silver-haired bat
Pipistrellus subflavus	pipistrelle
Eptesicus fuscus	big brown bat
Lasiurus borealis	red bat
Lasiurus cinereus	hoary bat
Procyon lotor	raccoon
Mustela cicognanii	small brown weasel
Mustela frenata	eastern long-tailed weasel
Mustela vison	northeastern mink
Lutra candensis	otter
Mephitis mephitis	striped skunk
Vulpes fulva	red fox
Urocyon cinereoargenteus	gray fox
Lynx rufus	bobcat
Marmota monax	woodchuck
Teania striatus	chipmunk
Tamiasciurus hudsonicus	red squirrel
Sciurus carolinensis	grey squirrel
Glauconus volans	flying squirrel
Castor canadensis	beaver
Peromyscus maniculatus	deermouse
Peromyscus leveopus	woodmouse
Synaptomys cooperi	lemming mouse
Clethrionouys gapperi	red-backed mouse
Microtus pennsulvanicus	field mouse
Pitymys pinetorum	pine mouse
Ondatra zibethica	muskrat
Mus musculus	house mouse
Rattus norvegicus	Norway rat
Zapus hudsonius	meadow jumping mouse
Napaeozapus insignis	woodland jumping mouse
Erethizon dorsatum	porcupine
Sylvilagus floridanus	eastern cottontail
Odocoileus virginianus	white-tailed deer

Table 24

Amphibians and Reptiles of Cazenovia Basin

Scientific Name	Common Name
Necturus maculosus	mudpuppy
Ambystoma laterale	blue-spotted salamander
Diemictylus viridesceus	red-spotted salamander
Desmognathus ochrophaeus	Allegheny salamander
Plethodon glutinosus	slimy salamander
Pseudotriton ruber	red salamander
Bufo americanus	common toad
Hyla crucifer	spring peeper
Pseudacris triseriata	western chorus frog
Rana clamitans	green frog
Rana palustris	pickerel frog
Ambystoma jeffersonianum	Jefferson's salamander
Ambystoma maculatum	spotted salamander
Desmognathus fuscus	dusky salamander
Plethodon cinereus	red-backed salamander
Gyrinophilus porphyricticus	spring salamander
Eurycea bislineata	two-lined salamander
Bufo woodhousei	Fowler's toad
Hyla versicolor	common treefrog
Rana catesbiana	bullfrog
Rana pipiens	leopard frog
Rana sylvatica	wood frog

Reptiles

Scientific Name	Common Name
Chelhydra serpentina	snapping turtle
Clemmys guttata	spotted turtle
Clemmys muhlegbergi	bog turtle
Graptemys geographica	map turtle
Emydoidea blandingi	Blanding's turtle
Natrix sipedon	common water snake
Storeria dekayi	DeKay's snake
Thamnophis brachystoma	garter snake
Diadophis punctatus	ringneck snake
Elaphe obsoleta	pilot blacksnake
Stenotherus edoratus	stinkpot
Clemmys insculpta	wood turtle
Terrapene carolina	box turtle
Chrysemys picta	painted turtle
Eureces authracinus	coal skink
Natrix septemuitlata	queen snake
Storeria occipitomaculata	red-bellied snake
Thamnophis sauritus	ribbon snake
Opheodrys vernalis	green grass snake
Lampropeltis doliata	milksnake

2.95 On a seasonal basis, bird life is essentially static during January and February. A noticeable migration usually begins in March as some of the winter visitants leave for the north; also, during the same month, a noticeable migration occurs from the south involving waterfowl, some birds of prey, and some land birds, in addition to winter visitants leaving the area during April and May. Migration reaches its peak with the spring waterfowl flight, shorebird migration, and the arrival of seedeaters and insectivorous birds. Migratory waterfowl using the flyways in the area include dabbling ducks, diving ducks, Canada geese and swans.

2.96 A complete listing of birds known to occur in the Buffalo area (from Beardslee and Mitchell, 1965) is given in Table 25. Most of these can reasonably be expected to occur in the Cazenovia Creek basin. Of the waterfowl, only dabbling ducks such as the mallard, black duck, gadwall, pintail, green winged teal, blue winged teal, European widgeon, northern shoveller, and wood duck might be expected. The creek is too shallow to support larger waterfowl or diving ducks such as the redhead ring-necked duck, canvasback, greater and lesser scaup, common goldeneye, bufflehead, oldsquaw, harlequin duck, king elder, white winged scoter, black and surf scoters, ruddy duck, and the common, redbreasted, and hooded mergansers.

2.97 Rare or Endangered Species

2.98 Species which are uncommon, rare, or endangered are particularly sensitive to change in the quality of the environment. Included are those species officially listed as rare or endangered in the United States.

2.99 The presence of rare or endangered species within the study area must be ascertained to determine if any improvements which might be recommended would directly (by actually destroying an organism) or indirectly (by habitat destruction or alteration) cause a decline in the rare or endangered populations. The loss of a rare or endangered species, or a decrease in the number of existing individuals with a known population, would constitute a decrease in environmental quality.

2.100 Six threatened wildlife species listed in this statement have ranges which cover the study area, two of which might be expected to be seen in the area. Five of these species are listed in the 1973 edition of "Threatened Wildlife of the United States," and one, the greater sandhill crane (Grus canadensis tabida) is listed in the 1968 edition of "Rare and Endangered Fish and Wildlife of the United States." Both editions are publications of the Department of Interior, Bureau of Sports Fisheries and Wildlife (recently renamed the Fish and Wildlife Service).

2.101 The southern bald eagle, Haliaeetus leucocephalus leucocephalus, (endangered) is known to have been reasonably abundant and to have nested

Table 25

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Permanent Residents	
Accipiter cooperi	Coopers' hawk
Buteo jamaicensis	red-tailed hawk
Falco sparverius	sparrow hawk
Bonasa umbellus	ruffed grouse (3)
Meleagris gallopavo	turkey
Tyto alba	barn owl
Otus asio	screech owl
Bubo virginianus	great horned owl
Strix varia	barred owl
Asio otus	long-eared owl
Dryocopos pileatus	pileate woodpecker
Centrurus carolinus	red-bellied woodpecker
Dendrocopos villosus	hairy woodpecker (2)
Dendrocopos pubsecens	downy woodpecker
Cyanocitta cristata	blue jay
Corvus brachyrhynchos	common crow
Parus atricapillus	black-capped chickadee
Parus bicolor	tuffed titmouse
Sitta carolinensis	white-breasted nuthatch
Thryothorus ludovicianus	Carolina wren
Mimus poyglottos	mockingbird
Richmondena cardinalis	cardinal
Colinus virginianus	bobwhite (2)
Phasianus colchicus	ring-necked pheasant
Alectoris graeca	chukar
Perdix perdix	gray partridge
Columba livia	rock dove
Sturnus vulgaris	starling
Passer domesticus	house sparrow
Summer Residents	
Podilymbus podiceps	pied-billed grebe
Ardea herodias	great blue heron
Butorides virescens	green heron
Nycticorax hoactli	black-crowned night heron
Ixobrychus exilis	least bittern
Botaurus lentiginosus	American bittern
Anas platyrhynchos	mallard
Anas rubripes	black duck
Anas discors	blue-winged teal
Spatula clypeata	shoveler

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Aix sponsa	wood duck
Cathartes aura	turkey vulture
Buteo lineatus	red-shouldered hawk
Buteo platypterus	broad-winged hawk
Circus cyaneus	marsh hawk
Rallus elegans	king rail
Rallus limicola	virginia rail
Porzana carolina	sora
Gallinula chloropus	common gallinule
Fulica americana	American coot
Charadrius vociferus	killdeer
Philohela minor	American woodcock
Capella gallinago	common snipe
Bartramia longicanda	upland plover
Actitis macularia	spotted sandpiper
Larus delawarensis	ring-billed gull
Sterna hirundo	common tern
Chilodonias niger	black tern
Zenaidura macroura	mourning dove
Coccyzus americanus	yellow-billed cuckoo
Caprimulgus vociferus	whippoorwill
Chordeiles minor	common nighthawk
Chaetura pelagica	chimney swift
Archilochus colubris	ruby-throated hummingbird
Megaceryle alcyon	belted kingfisher
Colaptes auratus	yellow-shafted flicker
Melanerpes erythrocephalus	red-headed woodpecker
Sphyrapicus varius	yellow-bellied sapsucker
Tyrannus tyrannus	eastern kingbird
Myiarchus crinitus	great crested flycatcher
Sayornis phoebe	eastern phoebe
Empidonax virescens	Acadian flycatcher
Empidonax traillii	Traill's flycatcher
Emiponax minimus	least flycatcher
Contopus virens	east wood pewee
Eremophila alpestris	horned lark (2)
Iridoprocne bicolor	tree swallow
Riparia riparia	bank swallow
Stelgidopteryx ruficollis	rough-winged swallow
Hirundo rustica	barn swallow
Petrochelidon pyrrhonota	cliff swallow
Progne subis	purple martin
Troglodytes aedon	house wren
Troglodytes troglodytes	winter wren

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Telmatodytes palustris	long-billed marsh wren
Cistothorus platensis	short-billed marsh wren
Dumetella carolinensis	catbird
Toxostoma rufum	brown thrasher
Turdus migratorius	robin (2)
Hylocichla mustelina	wood thrush
Hylocichla guttata	hermit thrush
Hylocichla ustulata	Swainson's thrush (2)
Hylocichla fuscescens	veery
Sialia sialis	eastern bluebird
Polioptila caerulea	blue-gray knatcatcher
Bombycilla cedrorum	cedar waxwing
Lanius ludovicianus	loggerhead shrike
Vireo flavifrons	yellow-throated vireo
Vireo solitarius	solitary vireo
Vireo olivaceus	red-eyed vireo
Vireo gilvus	warbling vireo
Mniotilta varia	black & white warbler
Protonotaria citrea	prothonotary warbler
Vermivora chrysoptera	golden-winged warbler
Vermivora pinus	blue-winged warbler
Vermivora ruficapilla	Nashville warbler
Dendroica petechia	yellow warbler (2)
Dendroica magnolia	magnolia warbler
Dendroica caerulesceus	black-throated blue warbler
Dendroica virens	black-throated green warbler
Debdroica fusca	Blackburnian warbler
Dendroica pensylvanicus	chestnut-sided warbler
Dendroica pinus	pine warbler
Seiurus auroccypillus	ovenbird
Seiurus noveboracensis	northern waterthrush
Seiurus motacilla	Louisiana waterthrush
Oporornis philadelphia	mourning warbler
Geothlypis trichas	yellowthroat
Icteria virens	yellow-breasted chat
Wilsonia citrina	hooded warbler
Wilsonia canadensis	Canada warbler
Setophaga ruticilla	American redstart
Dolichonyx oryzivorus	bobolink
Sturnella magna	eastern meadowlark

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Sturnella neglecta	western meadowlark
Agelaius phoeniceus	red-winged blackbird
Icterus spurius	orchard oriole
Quiscalus quiscula	common grackle
Molothrus ater	brown-headed cowbird
Piranga olivacea	scarlet tanager
Pheucticus ludovicianus	rose-breasted grosbeak
Passerina cyanea	indigo bunting
Carpodacus purpureus	purple finch
Spinus tristis	American goldfish
Pipilo erythrophthalmus	rufous-sided towhee
Passerculus sandwichensis	savannah sparrow
Ammodramus savannarum	grasshopper sparrow
Passerherbulus henslowii	Henslow's sparrow
Pooecetes graminius	vesper sparrow
Junko hyemalis	slate-colored junko (2)
Spizella passerina	chipping sparrow
Spizella pusilla	field sparrow
Melospiza georgiana	swamp sparrow
Melospiza melodia	song sparrow
Summer Visitants	
Florida caerulea	little blue heron
Casmerodius albus	common egret
Nyctanassa violacea	yellow-crowned night heron
Winter Visitants	
Aythya valisneria	canvasback
Aythya marila	greater scaup
Beucephala Clangula	common goldeneye
Bucephala islandica	Barrow's goldeneye
Clangula hyemalis	oldsquaw
Histrionicus histrionicus	harlequin duck
Somateria spectabilis	king eider
Mergus merganser	common merganser
Accipiter geutilis	goshawk
Buteo logapus	rough-legged hawk
Larus hyperboreus	glaucous gull

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Winter Visitants	
Larus glaucoides	Iceland gull (2)
Larus marinus	great black-backed gull
Larus argentatus	herring gull
Larus ridibundis	black-headed gull
Rissa tridactyla	black-legged kittiwake
Nyctea scandiaca	snowy owl
Asio flammeus	short-eared owl
Picoides arcticus	black-backed three-toed owl
Parus hudsonicus	boreal chickadee
Lanius excubitor	northern shrike
Hesperiphona vespertina	evening grosbeak
Pinicola enucleator	pine grosbeak
Acanthis hornemanni	hoary redpol (2)
Spinus pinus	pine siskin
Loxia curvirostra	red crossbill
Loxia leucoptera	white-winged crossbill
Junco oreganus	Oregon junko
Spizella arbonea	tree sparrow
Calcarius lapponicus	Lapland longspur
Plectrophenax nivalis	snow bunting
Transient Visitants	
Gavia immer	common loon
Gavia stellata	red-throated loon
Podiceps grisegena	red-necked grebe
Podiceps auritus	horned grebe
Podiceps caspicus	eared grebe
Aechmophorus occidentalis	western grebe
Phalacrocorax auritus	double-crested cormorant
Olor columbianus	whistling swan
Branta canadensis	Canada goose (2)
Branta bernicla	brant
Chen hyperborea	snow goose
Chen caerulescens	blue goose
Anas strepera	gadwall
Anas acuta	pintail
Anas carolinensis	green-winged teal
Mareca penelope	European widgeon
Mareca americana	American widgeon
Aythya americana	redhead

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Transient Visitors

Scientific Name	Common Name
Aythya collaris	ring-necked duck
Aythya affinis	lesser scaup
Bucephala albeola	bufflehead
Melanita deglandi	white-winged scoter
Melanita perspicillata	surf scoter
Oidemia nigra	common scoter
Oxyura jamaicensis	ruddy duck
Lophodytes cucullatus	hooded merganser
Mergus serrator	red-breasted merganser
Accipiter striatus	sharp-shinned hawk
Aquila chrysaetos	golden eagle
Haliaeetus leucocephalus	bald eagle (2)
Pandion halieatus	osprey
Falco peregrinus	peregrine falcon
Falco columbarius	pidgeon hawk
Coturnicops noveboracensis	yellow rail
Charadrius semipalmatus	semipalmated plover
Chardrius melodus	piping plover
Pluvialis dominica	American golden plover
Squatarola squatarola	black-bellied plover
Arenaria interpres	ruddy turnstone
Numenius phaeopus	whimbrel
Tringa solitario	solitary sandpiper
Catoptrophorus semipalmatus	willet
Totanus melanoleucas	greater yellowlegs
Totanus flavipes	lesser yellowlegs
Calidris canutus	knot
Erolia maritima	purple sandpiper
Erolia melanotos	perctoral sandpiper
Erolia fuscicollis	white-rumped sandpiper
Erolia bairdii	Baird's sandpiper
Erolia minutilla	least sandpiper
Erolia alpina	dunlin
Limnodromus griseus	short-billed dowitcher
Limnodromus scolopaceus	long-billed dowitcher
Micropalama himantopus	stilt sandpiper
Ereunetes pusillus	semipalmated sandpipe
Ereunetes mauri	western sandpiper
Tryngites subruficollis	buff-breasted sandpiper

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Transient Visitors	
Limosa fedoa	marbled godwit
Limosa haemastica	Hudsonian godwit
Crocethia alba	sanderling
Phalaropus fulicarius	red phalarope
Stegnaopus tricolor	Wilson's phalarope
Lobipes lobatus	northern phalarope
Stercorarius pomarinus	pomarine jaeger
Stercorarius parasiticus	parasitic jaeger
Larus atricilla	laughing gull
Larus pipixcan	Franklyn's gull
Larus minutis	little gull
Xema sabina	Sabine's gull
Sterna forsteri	Forster's tern
Hydroprogne caspia	Caspian tern
Aegolius acadicus	saw-whet owl
Tyrannus verticalis	Western kingbird
Empidonax flaviventris	yellow-bellied flycatcher
Nuttallornis borealis	olive-sided flycatcher
Sitla canadensis	red-breasted nuthatch
Certhia familiaris	brown creeper
Hylocichla minima	gray-cheeked thrush(2)
Regulus satrapa	golden crowned kinglet
Regulus calendula	ruby crowned kinglet
Anthus spinoletta	water pipit
Vireo griseus	white-eyed vireo
Vireo philadelphicus	Philadelphia vireo
Vermivora peregrina	Tennessee warbler
Parula americana	parula warbler
Dendroica tigrina	Cape May warbler
Dendroica coronata	Myrtle warbler
Dendroica castanea	bay-breasted warbler
Dendroica striata	blackpoll warbler
Dendroica discolor	prarie warbler
Dendroica palmarum	palm warbler (2)
Oporornis formosus	Kentucky warbler
Oporornis agilis	Connecticut warbler
Wilsonia pusilla	Wilson's warbler
Xanthocephalus xanthocephalus	yellow-throated blackbird

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Transient Visitors	
Euphagus carolinus	rusty blackbird
Ammospiza caudacuta	sharp-tailed sparrow (2)
Chondestes grammacus	lark sparrow
Zonotrichia querula	Harris' sparrow
Zonotrichia leucophrys	white-crowned sparrow
Zonotrichia albicollis	white-throated sparrow
Passerella iliaca	fox sparrow
Melospiza lincolnii	Lincoln's sparrow
Anas crecca	common teal
Spizella pallida	clay-colored sparrow
Cygnus olor	mute swan
Other	
Pelecanus erythrorhyn chus	white pelican
Morus bassanus	gannet
Bubulcus ibis	cattle egret
Plegadis falcinellus	glossy ibis
Pica pica	black-billed magpie
Corvus corax	common raven
Helmintheros vermivorus	worm-eating warbler
	Lawrence's warbler
Dendroica dominica	yellow-throated warbler
Spiza americana	dickcissel
Leucophoyx thula	snowy egret
Hydranassa tricolor	Louisiana heron
Branta leucopsis	barnacle goose
Branta nigricans	black brant
Somateria molissina	common eider (2)
Coragyps atratus	black vulture
Falco rusticolus	gyrfalcon
Laterallus jamaicensis	black rail
Porphyrula martinica	purple gallinule
Philomachus pugnax	ruff
Recurvirostra americana	American avocet
Uria lomvia	thick-billed murre
Surnia ulula	hawk-owl
Strix nebulosa	great grey owl
Aegolius funereus	boreal owl
Picoides tridactylus	northern 3-toed woodpecker
Thryomanes bewickii	Bewick's wren
Bombycilla garrula	Bohemian waxwing
Dendroica nigrescens	black-throated grey warbler

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Other	
Piranga rubra	summer tanager
Chlorura chlorura	green-tailed towhee
Gavia arctica	Arctic loon
Pterodroma hasitata	black-capped petrel
Pterodroma inexpectata	scaled petrel
Oceanites oceanicus	Wilson's petrel
Phaethon lepturus	white-tailed tropic bird
Pelecanus occidentalis	brown pelican
Plegadis chihi	white-faced ibis
Anser albifrons	white-fronted goose
Mergellus albellus	smew
Elanoides forficatus	swallow-tailed kite
Buteo swainsonii	Swainson's hawk
Grus canadensis	sandhill crane
Haematopus palliatus	American oystercatcher
Numenius americanus	longbilled curlew
Numenius tenuirostris	slender-billed curlew
Heteroscelus incanum	wandering tattler
Catharcta skua	skua
Larus fuscus	lesser black-backed gull
Larus novaeOhollandiae	silver gull
Pagophila eburnea	ivory gull
Sterna paradisaea	arctic tern
Sterna dougallii	roseate tern
Sterna albifrons	least tern
Rynchops nigra	black skimmer
Cepphus grylle	black guillemot
Carduelis carduelis	European goldfinch
Synthliboramphus antiquum	ancient murrelet
Sayornis saya	Say's phoene
Oreoscoptes montanus	sage thrasher
Oenanthe oenanthe	wheatear
Piranga ludoviciana	western tanager
Pheucticus melanocephalus	blackhead grosbeak

successfully along the Niagara River, especially near Goat and Grand Islands before the turn of the century. However, bridges to these islands and residential development along the river displaced these populations. Occasional sightings of this species are reported, but no active nesting sites within Erie County are now known.

2.102 The American peregrine falcon, Falco peregrinus anatum, (endangered) is infrequently seen in the area of the Lake Erie and Lake Ontario shores during their migration through the region. Beardslee and Mitchell (1965) define these periods as March 15 to May 20 and September 6 to October 15, with the greater number being sighted in the fall period. The number of sightings of this falcon in Erie County has been drastically reduced within the last two decades reflecting the serious overall decline in this species.

2.103 The greater sandhill crane, Grus canadensis tabida, is classified as rare. The range for this species is reported to include infrequent breeding in southwestern Ontario. It is known as an accidental visitant to the Niagara Frontier Region. However, in the Niagara Peninsula area of the Province of Ontario a greater sandhill crane was reliably reported in 1969.

2.104 Two mammal species, both endangered, have ranges in this area, though it is highly unlikely that either occurs within Erie County, NY. The Indiana bat, Myotis sodalis, is associated with limestone caves throughout the midwest and eastern United States. Since no limestone caves occur in the project area, this species should not be encountered. The eastern timber wolf, Canis lupus lycaon, did range freely over this region of New York, as it did over most of the eastern United States. However, it is now believed to be nearly, if not totally, extinct within the borders of the original 48 states of the United States except for limited populations in northern Minnesota and Michigan. The last authenticated record of the wolf in New York is 1899, though a sighting is recorded in Fulton County in 1968.

2.105 Another rare species, the bog turtle (Clemmys muhlenbergi) is reported in a broken range from Connecticut to southwestern North Carolina. Conant gives the habitat for this species as swamps, sphagnum bogs, and slow-flowing stream. Such habitats do occur within the Cazenovia Creek Basin, but Conant does not include this area in the range.

2.106 No endemic species have been identified within the project area. The lack of identification of any species does not preclude their existence, though none would be anticipated within this area.

2.107 Aesthetic Qualities

2.108 Cazenovia Creek has considerable scenic values. Upstream from Union Road, the stream rises rapidly, eroding its bed and creating a steep-walled gorge. Vertical outcroppings, initially along the south bank and varying with the meanders of the creek further upstream, create a rugged and very scenic gorge, particularly in the Elma section. This gorge generally continues upstream along the West Branch to the hamlet of West Falls. Rock is exposed in portions of the stream channel at numerous locations, and the rate of flow is quite rapid. The East Branch, after winding through the Village of East Aurora flows through relatively level terrain and develops extensive meanders with shallow embankments.

2.109 Waste Disposal

2.110 Municipal wastes from South Buffalo and West Seneca are ultimately handled by City of Buffalo treatment facilities. The Town of Aurora's needs are serviced by the Village of East Aurora Sewage Treatment Plant. A small plant is operated in West Falls, while a septic tank effluent interceptor discharges untreated waste into Cazenovia Creek in the hamlet of Holland. Under a State-adopted water resource development plan, these effluents will be pumped to an enlarged East Aurora facility.

2.111 Historical, Archeological, and Paleontological Considerations*

2.112 The early human habitation of the area may be divided into American Indian and Early Settler. The presence of Iroquois Indians and the Buffalo Creek Indian Reservation delayed European settlement until about 1844. Therefore, archeological interest centers on the period of Indian habitation. No sites of unique paleontological interest are known to exist in the area.

2.113 The Indian occupation of the study area prior to the 18th century was by an Iroquois group, the Erie. Their occupation ceased about 1650 A.D. They can be traced back into prehistoric (pre-1575 A.D.) times, where there is a long, probably uninterrupted occupation back to 3000 B.C. at least.

2.114 A number of pre-Reservation archeological sites are reported between Cazenovia Street and Mill Road in West Seneca. Since the Cazenovia Creek Valley has never been systematically surveyed for archaeological sites, it seems likely that those reported are only a fraction of the ones present. Buried occupation sites might be expected in bottomlands like those from Transit Road west.

2.115 The Buffalo Creek Reservation was established in 1797 at the Treaty of Big Tree and included 83,557 acres surrounding the Iroquois settlements on the Buffalo River. During the half century of the Buffalo

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*Literature search for archeological survey of the creek and its tributaries was conducted by Professor Marian White, of the Department of Archeology, State University of New York at Buffalo.

Creek Reservation's existence, it became the center for the remaining Iroquois in New York. While other Reservations were stable or declining, Indians swarmed to Buffalo Creek, which became the political center of Indian-White land deals.

2.116 The population of the Reservation was predominantly Seneca. A number of Cayuga and Onondaga had their own settlements and ceremonial longhouses. There were also Stockbridge from Massachusetts and Delaware from Pennsylvania. These Indians lived in clusters of cabins or in linear arrangements of houses spread out along the trails of which Seneca Street was the main one. This area was one of the centers of activity on the old Buffalo Creek Reservation. The Onondaga village of Big Sky consisting of 28 cabins was scattered along here in 1791. This centered around the old ford, now the bridge on Ridge Road which connects Potters Road to Seneca Street. On the east side of Cazenovia Creek was the Onondaga longhouse which served as council house for the League of the Iroquois and became a focal point of Reservation life. The Reservation population thinned out as one went father from Buffalo, and it is impossible to point to specific settlement locations east of Union Road.

2.117 In 1826, over one-third of the Buffalo Creek Reservation was sold, including the Mile Strip off the southern margin. This sale had little immediate effect upon European settlement, since only two small communities founded by early settlers lay just south of the Reservation. These were Willink (East Aurora) and East Hamburg (Orchard Park), whose communication lines were through the Reservation to Buffalo.

2.118 Between 1844 and 1846, the remainder of the Buffalo Creek Reservation was sold to settlers and most of the Indians moved away, opening the area for quick settlement. A German commercial group known as the Inspirationalists purchased a tract of about 5,000 acres. In 1846, they incorporated the Village of Ebenezer (now Gardenville area). At the same time, other settlers founded the Villages of West Seneca Center, East Seneca, Reserve, Gardenville, and Winchester. Many others, especially Germans, moved into make individual purchases of the fertile land along Buffalo and Cazenovia Creeks.

2.119 The Hart family bought a large parcel of land covering both sides of Cazenovia Creek in what is now South Buffalo. Part of this land is the present-day Cazenovia Park. The Hart holdings were subdivided among members of the family in the late 19th century. This period was also marked by extensive collecting of Indian artifacts by amateur collectors. Those people uncovered the Reservation settlement along Seneca Street and located Indian graves of the Historic Period north of the creek in the area under the present golf course. These may belong to the late 17th century Neutral Iroquois village which was south of the creek in the West Seneca area.

2.120 Extensive surface collections now at the State University of New York at Buffalo show evidence of several Archaic occupations, including Meadow-wood, a Woodland Hunters Home, and a prehistoric Erie Indian village. However, the precise location of any of these occupation areas within the Hart Farm is unknown due to the presence of the park and golf course.

2.121 The birthplace of Millard Fillmore, 13th president of the United States (1850-53), is located in East Aurora. This site has recently been included in the National Register of Historic Places. No other National Register properties or Historic Landmark sites either included or eligible for inclusion in the National Register are known to exist in the Cazenovia basin. To verify this observation, comments have been requested from the New York State Office of Parks and Recreation and the U. S. Department of the Interior. Letters requesting comments from these agencies are included in Appendix B, entitled "Letters of Coordination."

2.122 Socioeconomic Considerations

2.123 Population

2.124 Table 26 presents 1970 U. S. Bureau of Census population data and population projects for 1980 - 2000 for Cazenovia Creek basin communities as developed by the Erie and Niagara Counties Regional Planning Board (ENCRPB). The total basin population in 1970 was 163,847. As projected, this figure will rise to 251,860 by the year 2000. The Towns of Elma, Aurora, Boston, and West Seneca are expected to contribute heavily to this growth.

2.125 Employment, Education, and Income

2.126 For the purposes of this report, Cazenovia Creek is divided into three parts: the upper basin, above the confluence of the East and West Branches; the central basin, including the Towns of Elma and Aurora and the Village of East Aurora; and the lower basin, comprised of West Seneca and South Buffalo. Flood damage is greatest in the lower basin and the community of East Aurora. Proposed remedial efforts would have their greatest socioeconomic impact in the lower and central basins. Socioeconomic data, including data on education and income for the creek basin communities, the county, and the State are given in Table 27. Insofar as the upper basin experiences little serious flood damage and would be little affected by proposed remedial measures downstream, its treatment here will be brief.

2.127 The communities of the upper basin are rural population centers amid extensive agricultural areas and woodlands. On the West Branch, the largest of these are Glenwood and Colden in the Town of Colden. On the East Branch, major communities include West Falls in the Town of Aurora, Holland in the Town of Holland, and South Wales in the Town of Wales.

2.128 The communities of the central basin, including the Villages of East Aurora in the Town of Aurora and Elma in the Town of Elma, are socioeconomically quite similar, as evidenced by the data presented in Table 27. They are suburban towns sharing an attractive wooded locale. The Village of East Aurora, with a populaton (1970 Census) of 7,033, is a small residential community. Population growth, though considerable, is less than in neighboring locales due to limitations on available land. Mean and median income figures (see Table 27) reveal a skewness that indicates high income families. 1970 census data reveal numerous families in the $50,000+ income bracket. Educational attainment is high with over 25 percent of the adult population having completed four or more year of higher education. Census data reveal that many residents of the village hold professional, educational, managerial, and sales positions. Most workers commute by private auto to Buffalo or adjacent towns via Route 400 (Aurora Expressway).

2.129 The Towns of Elma and Aurora are essentially rural communities, but are undergoing rapid suburbanization in their western sectors. They are quite similar in terms of area (35.1 square miles and 36.8 square miles for Elma and Aurora respectively), physical setting, income base, and educational attainment (see Table 27). Historically, farming has played an important role in these communities, but in recent years has declined dramatically due to increasing land values and tax rates. The western sections of Elma and Aurora are the focus of expansion, spurred by the completion of the Aurora Expressway. Land in these areas has been subdivided into attractive homesites which retain the rural style of country living. The eastern sections of these towns have not been developed as extensively, and much of the remaining farmland is situated there. The 1970 populations of Elma and Aurora are respectively 10,011 and 7,400. The populations are heterogeneous--census data indicate that long-established residents are rural/agriculturally oriented and newer residents are suburban/professionally oriented.

2.130 The lower basin includes the major population centers of West Seneca and South Buffalo. West Seneca is one of the fastest growing communities (in terms of population) in Western New York. Once a rustic agricultural community, West Seneca is becoming suburbanized rapidly as need for new housing and skyrocketing land and tax valuations render farming decreasingly profitable. Census figures indicate West Seneca's population was 48,404 in 1970. If growth projections are realized, the town's 21.6 square miles will attain a population of over 80,000 people by the year 2000. From social and economic standpoints, West Seneca is a typical lower middle to middle class suburb, absorbing a large proportion of the outward urban movement. Population mobility is nonetheless considerable, with turnover between 1965 and 1970 ranging as high as 30 percent in individual census tracts (see Table 27). Occupationally, the townspeople are a heterogeneous mix of blue and white collar workers, including many in service-oriented professions.

Table 26

Population in Cazenovia Creek Basin, 1970-2000

AREA	1970		1980		1990		2000	
	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population
South Buffalo[1]	45,015	27.5	40,450	21.0	37,565	16.8	36,515	14.5
West Seneca	48,404	29.5	60,765	31.5	73,725	33.0	82,035	32.6
Elma	10,011	6.1	11,580	6.0	13,155	5.9	14,770	5.9
Aurora	14,426	8.8	16,065	8.3	18,735	8.4	21,335	8.5
Orchard Park	19,978	12.2	33,175	17.2	44,950	20.1	57,265	22.7
Boston	7,158	4.4	8,400	4.4	9,675	4.3	11,135	4.4
Colden	3,020	1.8	3,500	1.8	3,970	1.8	4,510	1.8
Holland	3,140	1.9	3,935	2.0	4,735	2.1	5,535	2.2
Wales	2,617	1.6	3,120	1.6	3,660	1.6	4,220	1.7
Concord	7,573	4.6	9,115	4.7	10,065	4.5	11,315	4.5
Sardinia	2,505	1.5	2,655	1.4	2,870	1.3	3,225	1.3
Total	163,847	99.9(2)	192,760	99.9(2)	223,105	99.8(2)	251,860	100.1(2)

Notes:

(1) South Buffalo defined as Buffalo Projection Boundary Area 2 (Census Tracts 2, 6, 7, 8, 9, 10, 11) by Erie-Niagara Counties Regional Planning Board; all other areas are defined by their respective townships.

(2) Percentages may not add to 100.0% due to rounding.

Sources: N. Y. State Dept. of Commerce, Business Fact Book, Buffalo Area, Part 2, Population and Housing (Albany N. Y. State Dept. of Commerce, 1963), 1940-1960 data, Erie-Niagara Counties Regional Planning Board, Regional Population Projections (Grand Island, NY: Erie-Niagara Counties Regional Planning Board, 1972), 1970-2000 data.

Table 27

General Socioeconomic Data for Cazenovia Creek Basin Communities, 1970

Community	Median School Years Completed	Median Income of Families ($)	Mean Income of Families ($)	% Families Below Poverty Level	% Unemployment	Median Home Value($)	Model Home Value Class ($)	Community Mobility	U. S. Census Tract Number
South Buffalo	11.0-12.1	9,193- 10,144	9,926- 11,342	1.2-5.9	3.5-4.6	13,100- 14,200	10,000-15,000	n.a.	
West Seneca (T)	12.1	11,751	12,274	3.2	1.7-4.5	14,400- 22,900	25,000-30,000	11.9	
Elma (T)	12.3	12,404	13,393	4.1	1.8	23,750	25-35,000	8.9	
West Elma (U)	12.1	11,612	11,732	6.2	1.8	21,600	25-35,000	n.a.	141.02
East Elma (U)	12.5	13,231	15,085	2.0	1.9	25,900	25-35,000	n.a.	141.01
Aurora (T)	12.6	12,192	14,346	3.1	1.7	23,800	25-35,000	13.0	
East Aurora (V)	12.6	11,900	14,260	3.0	4.2	20,700	15-20,000	n.a.	139 and 140
Orchard Park (T)	12.4	12,419	15,883	3.3	3.3	23,800	15-20,000	11.6	135
Boston (T)	12.3	11,349	12,002	3.4	3.0	22,200	15-20,000	10.6	152.01
Colden (T)	12.1	9,840	10,778	4.4	5.5	18,700	15-20,000	10.2	151.01
Holland (T)	12.3	9,657	10,115	8.3	5.7	16,500	15-20,000	14.6	150.03
Wales (T)	12.2	10,867	11,341	8.6	2.5	20,500	15-20,000	11.7	150.02

Table 27 (Cont'd)

Community	Median School Years Completed	Median Income of Families ($)	Mean Income of Families ($)	% Families Below Poverty Level	% Unemployment	Median Home Value($)	Model Home Value Class ($)	Community Mobility	U. S. Census Tract Number
Concord (T)	12.1	9,734	10,715	5.7	3.7	15,800	15-20,000	14.8	158
Sardinia (T)	10.4	9,886	10,757	5.1	5.1	15,400	10-15,000	20.0	151.02
Erie County	12.0	10,482	12,205	6.9	4.4	18,500	15-20,000	15.8	
New York State	12.1	10,617	12,498	8.5	3.6	28,200	25-35,000	15.4	

Sources: U. S. Government Printing Office, 1970 Census
New York State Office of Planning Services, 1970 Census Socio-Economic Profile (Albany: New York State Office of Planning Services, 1973)

New York State Office of Planning Services, Selected 1970 Census Statistics for New York State Minor Civil Divisions (Albany: New York State Office of Planning Services, 1973)

Notes: n.a. - not available (V) - village
(T) - town (U) - unincorporated

2.131 For the purposes of this report, South Buffalo is considered to consist of census tracts 2, 6, 7, 8, 9, 10, and 11, lying along the southeast perimeter of the city. This is primarily a residential area, reporting a 1970 population of 45,015. Census figures indicate that blue-collar workers are heavily represented in the area's labor force. Many residents are employed by nearby industries, such as the Republic and Bethlehem steel plants. Housing density is high due to the small size of individual plots. Except for Cazenovia Park, open land is virtually nonexistent and flood plain development is extensive. Population growth is expected to be slow.

2.132 Existing Development and Land Use

2.133 Residential, Commercial, and Industrial Development

2.134 Existing land uses in Cazenovia Creek basin follow a typical pattern: agricultural uses are supplanted by residential, commercial, and eventually industrial development radiating outward from a central hub of activity, in this case, Buffalo. While upper basin communities are still agriculturally oriented, central and lower basin communities are now undergoing the process of urbanization, as farmlands are sub-divided for residential use. Table 28, derived from the 1964 Census of Agriculture, Erie County, prepared by the Department of Agricultural Economics, Cornell University in 1967, gives agricultural data for communities of the Cazenovia Creek basin. While the data was not extrapolated beyond 1964, the decline of farming in the area, especially in the lower and central basins, is evident.

2.135 At present, the most concentrated residential, commercial, and industrial developments are in the lower basin. With the exception of small industrial parks in Elma, Orchard Park, and West Seneca, basin industry is confined within the Buffalo City Limits. Heavy industry is actually located downstream of the Buffalo River-Cazenovia Creek confluence, and hence out of the study area proper. However, strong economic interaction is to be expected between these heavy industries (such as Republic Steel) and the lower basin communities. The lower basin itself is the site of many warehouses and some light industrial development.

2.136 Commercial development is quite extensive in the lower basin and is concentrated along major thoroughfares such as Seneca Street and Union Road. For example, Southgate Plaza is located at the junction of these roads in West Seneca. This shopping complex includes 43 stores and 500,000 square feet of floor space. About 30 other businesses are in the near vicinity of Southgate Plaza. Approximately three miles west of Southgate Plaza is Seneca Mall, a larger shopping complex. Plates 16 and 17 are land use and reference maps for the West Seneca area of the lower basin.

2.137 Recreation

2.138 There are a variety of recreational facilities in the study area, including town and County parks. Cazenovia Park in South Buffalo includes several baseball diamonds and a golf course and provides opportunities for picnicking in summer and sledding in winter. Mill Road Park in West Seneca provides limited facilities in a scenic woodland setting. Facilities for skiing and tobaggening are available in the upper portions of the basin where, in addition, Emery Park in South Wales and Sprague Brook Park in Concord provide camping, hiking, and picnicking opportunities. Table 29 lists the facilities available at these parks. Table 30 gives visitation figures for these parks for the years 1969-1973 as compiled by the County Division of Parks. West Seneca is also the site of several bowling alleys and a propoced indoor ice rink complex.

Table 28

Cazenovia Creek Basin Agricultural Data

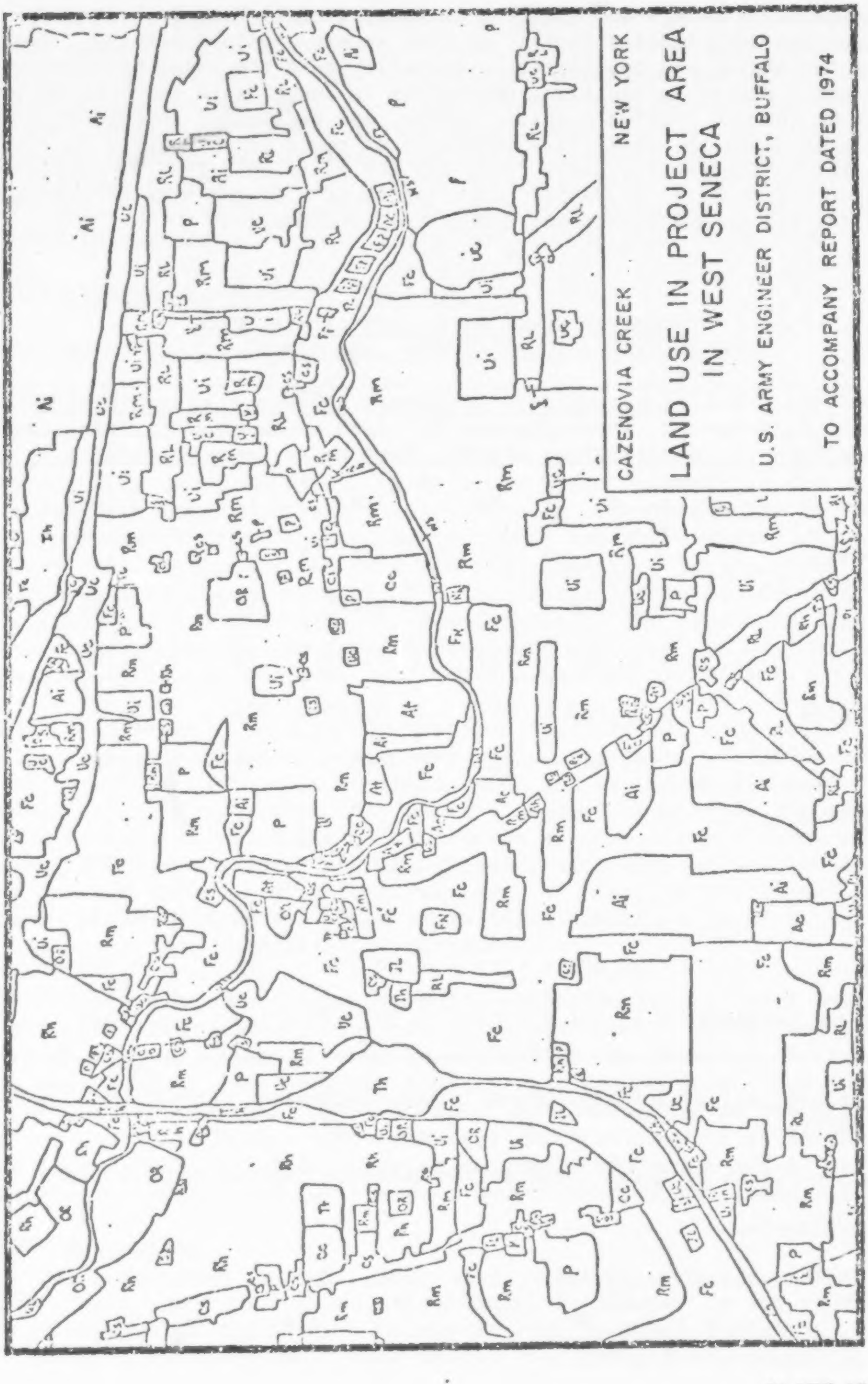
Location	1954		1959		1964	
	Farm Acreage	Number of Farms	Farm Acreage	Number of Farms	Farm Acreage	Number of Farms
Lower Basin	NA	NA	NA	NA	3,108	98[1]
Central Basin						
Elma	12,870	214	10,441	117	9,509	101
Aurora	11,307	132	7,248	76	6,208	56
Orchard Park [2]	12,003	207	8,213	121	5,793	83
Wales [2]	16,217	125	14,376	94	11,934	76
Upper Basin						
Boston	14,461	158	10,252	91	9,970	79
Colden	12,814	113	7,992	63	8,557	66
Concord	33,476	272	29,233	218	27,558	169
Holland and Sardinia	41,254	306	27,597	169	24,211	141

[1] Census included all of Buffalo, Grand Island, Lackawanna, Cheektowaga, and Tonawanda in this figure.

[2] Only small portions of these towns are actually in Cazenovia Creek Basin.

NA - not available.

Source: 1964 Census of Agriculture, Erie County, Cornell University, 1967.



CAZENOVIA CREEK NEW YORK

LAND USE IN PROJECT AREA IN WEST SENECA

U.S. ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

NOTE: SEE NEXT PAGE FOR LAND USE AREA CODES

PLATE 16

LAND USE AREA CODES

Active Agriculture

Ao	Orchard
Av	Vineyard
Ah	Horticulture
At	High intensity
Ac	Cropland/Cropland pasture
Ap	Permanent pasture

Inactive

Ai	Ag. Extensive
Ui	Urban Intensive
Uc	Ui Under construction

Specialty Farms

Ay	Mink, Game, Aquatic Ag., Horse farms

Forestland

Fc	Brush cover up to fully stocked poles less than 30' (may be Fb, early map)
Fn	Forests over 30'
Fp	Plantations - any size

Water

Wn	Natural - any size
Wc	Artificial 1 acre
Ws	Streams, rivers 100'

Wetlands

Wb	Bogs, shrub wetlands
Ww	Wooded wetlands
Wm	Marine waters-navigable (St. Lawrence & Great Lakes)
Wh	Hudson River

Non-productive

Ns	sands
Nr	exposed rocks

Public

P	All categories

Residential

Rh	High density-50' frontage
Rm	Medium density-50-100' frontage
Rl	Low density-over 100' frontage
Rs	Strip with Max. of 1/3 intermixture of Cs Commercial
Rr	Rural hamlet
Re	Estates 5 acres
Rc	Farm labor camp

Shoreline

Rk	Shoreline developed

Commercial

Cu	Urban (downtown)
Cc	Shopping center
Cs	Commercial strip with max. of 1/3 intermixture of Rs or Density Housing
Cr	Resorts

Industrial

Il	Light manufacturing
Ih	Heavy manufacturing

Outdoor Recreation

OR	All categories

Extractive

Eg	gravel, sand
Es	stone quarries
Em	minerals, cement, clay
Eu	oil, gas, salt

Transportation

Th	highway (limited access)
Tb	barge canal (channel, lock)
Tp	port or dock
Td	ducks or dams
Ts	shipyards
Ta	airport-any type
Tr	railroad

Table 29

Facilities Inventory for Public Parks in Cazenovia Creek Basin

	Cazenovia Park	Emery Park	Sprague Brook Park	Mill Road Park
Picnic Tables	x	x	x	x
Baseball	x	x	x	
Golf Course	x	x	x	
Skiing		x	x	
Hiking Trails		x	x	
Fishing			x	
Bike Paths	x	x	x	

Table 30

Visitation Data for Public Parks in Cazenovia Creek Basin

	Emery Park	Sprague Brook
1973	639,551	164,875
1972	381,839	95,279
1971	271,603	102,617
1970	305,471	68,036
1969	424,402	-

* no data available for Mill Road Park or Cazenovia Park

Information in these tables derived from Erie County Division of Parks records.

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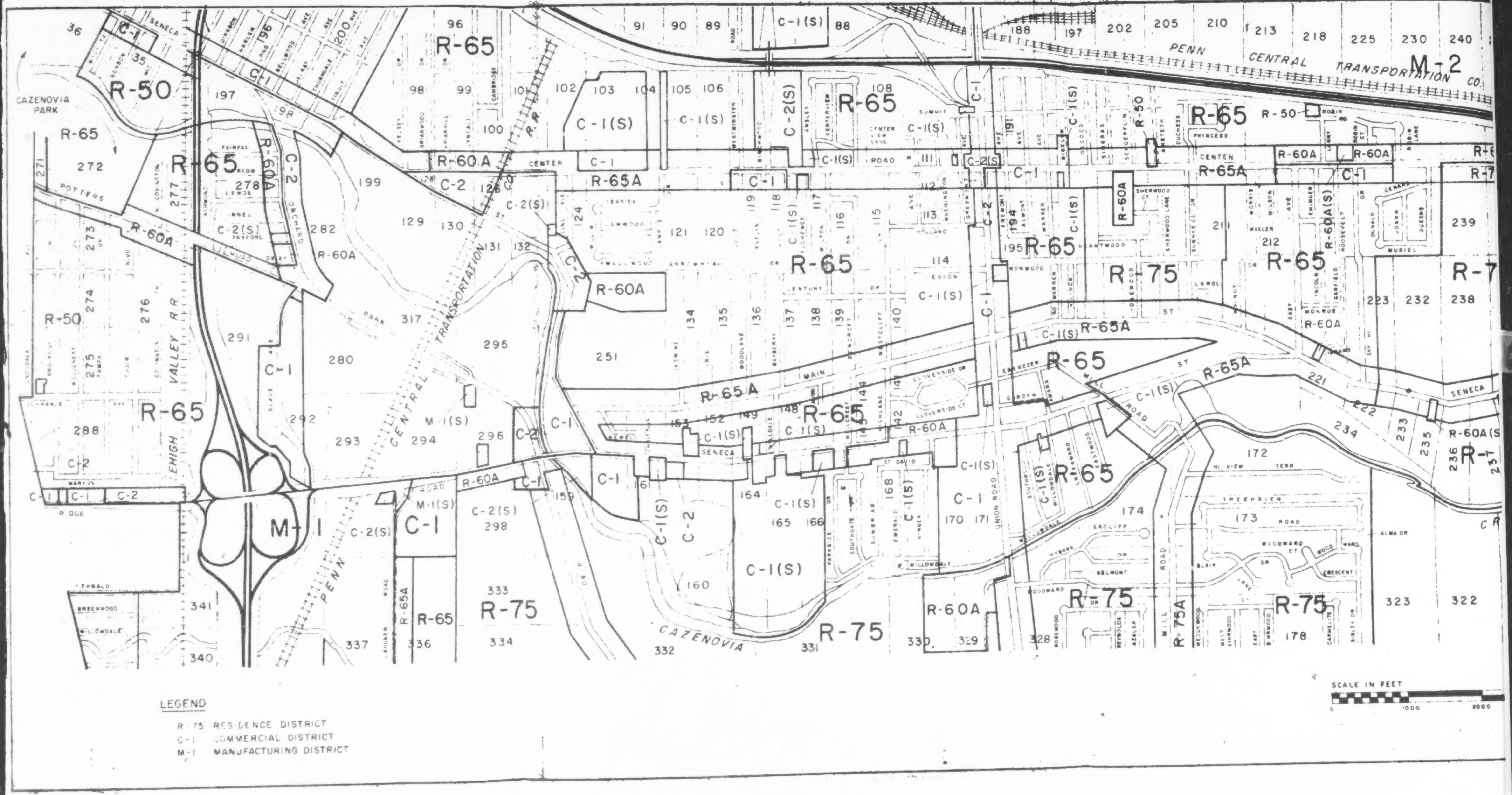
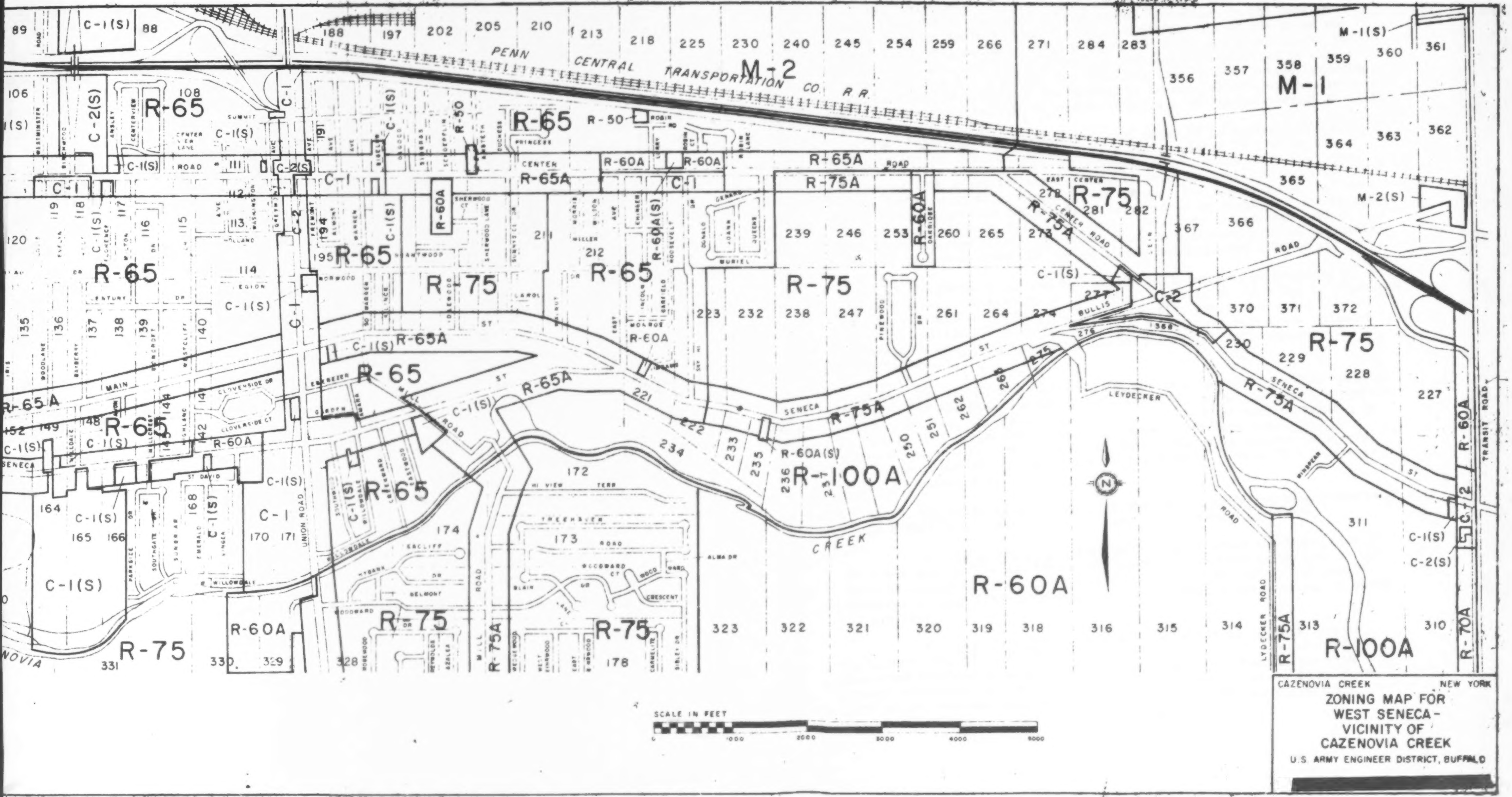

CAZENOVIA PARK
R-50
R-65
R-60A
R-65A
R-75
R-75A
C-1
C-1(S)
C-2
C-2(S)
M-1
M-1(S)
M-2
PENN CENTRAL TRANSPORTATION CO.
CENTRAL TRANSPORTATION
PENN
LEHIGH VALLEY R.R.
SENECA
CENTER ROAD
MAIN ST
UNION ROAD
MILL ROAD
POTTERS ROAD
CAZENOVIA
WILLOWDALE
PARK
SCALE IN FEET
0
1000
2000
LEGEND
R-75 RESIDENCE DISTRICT
C-1 COMMERCIAL DISTRICT
M-1 MANUFACTURING DISTRICT


PENN CENTRAL TRANSPORTATION CO. R.R.
M-2
M-1
M-1(S)
M-2(S)
R-65
R-65A
R-75
R-75A
R-60A
R-60A(S)
R-50
R-100A
R-70A
C-1
C-1(S)
C-2
C-2(S)
CENTER ROAD
EAST CENTER ROAD
MAIN
SENECA ST
UNION ROAD
MILL ROAD
LEYDECKER ROAD
TRANSIT ROAD
BULLIS ROAD
HI VIEW TERR
CREEK
N
SCALE IN FEET
0
1000
2000
3000
4000
5000

CAZENOVIA CREEK NEW YORK

ZONING MAP FOR
WEST SENECA -
VICINITY OF
CAZENOVIA CREEK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

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2.140 Future Development and Land Uses

2.141 Urbanization and changing land use from agriculture to other uses is expected to continue in this basin. According to the Erie and Niagara Counties Regional Planning Board (ENCRPB), all of the lower and central basin will become urbanized by 1990. Small industrial parks in West Seneca, Elma, and Orchard Park may reasonably be expected to expand. As shown in Plate 17, a zoning map, the open land in West Seneca bordering Cazenovia Creek is zoned for residential or commercial development, including proposed development of an apartment complex and an ice skating facility.

2.142 Future Recreational development might be in accordance with the Parks, Recreation and Open Space Study Plan, completed in 1969 by the Erie and Niagara Counties Regional Planning Board, which noted that the shortage of open space in Erie and Niagara Counties could, without remedial action, become more significant in the future. The report noted that open space in outlying areas would have to be acquired to supplement the parkland needs of more intensely developed areas. The study recommended public acquisition and control of open space land along streams such as Cazenovia Creek and in forest areas for use as linear environmental corridors.

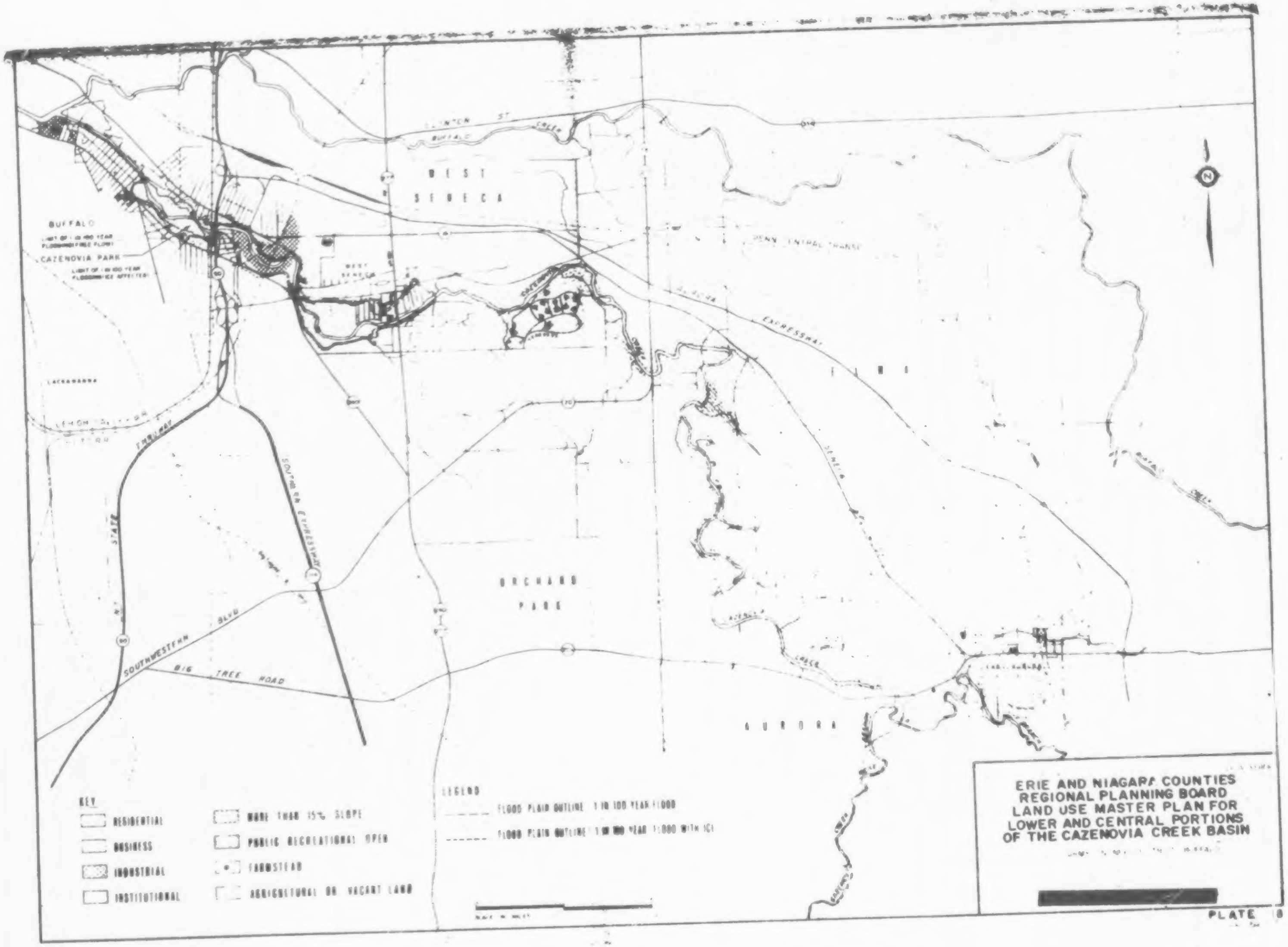
2.143 Cazenovia Creek can be regarded as a corridor penetrating an urbanized area. Acquisition of open space which is in the midst of developed land and is easily accessible by the surrounding population would help to more fully utilize the recreational potential of Cazenovia Creek while at the same time discouraging undesirable developments in floodprone areas of the valley.

2.144 The ENCRPB formulated a land use development plan which included provision for the preservation of environmentally or aesthetically prominent natural features. In addition, such features would be made accessible to the public by the creation of an environmental corridor consisting of a series of small parks and bicycle and pedestrian paths linking Cazenovia Park in South Buffalo to Emery Park in South Wales. Plate 18 illustrates the ENCRPB recommended land use plan.

2.145 The Regional Recreation Implementation Study and Plan prepared by the ENCRPB in September 1971 proposed the following parklands:

a. Cazenovia Park Extensions - Vacant areas on either side of the creek west of the New York State Thruway would form extensions to the existing Cazenovia Park. The flood plain area on the north bank may be preserved through flood plain zoning. Three small areas totaling 12 acres are provided.

b. Town Park - West Seneca - The ENCRPB proposed a 37-acre strip park east of Orchard Park Road with access to the opposite side of the creek provided by a pedestrian bridge. Based on discussions with nearby residents, artifacts such as arrowheads can occasionally be found here as the site was once an Indian burial ground and has significant historical value.



ERIE AND NIAGARA COUNTIES
REGIONAL PLANNING BOARD
LAND USE MASTER PLAN FOR
LOWER AND CENTRAL PORTIONS
OF THE CAZENOVIA CREEK BASIN

PLATE 8

BUFFALO
CAZENOVIA PARK
LACKAWANNA
WEST SENECA
ORCHARD PARK
AURORA
CLINTON ST
BUFFALO CREEK
PENN CENTRAL TRANS.
AURORA EXPRESSWAY
SOUTHERN EXPRESSWAY
STATE THRUWAY
SOUTHWESTERN BLVD
BIG TREE ROAD
SENECA
CAZENOVIA CREEK
KEY
RESIDENTIAL
BUSINESS
INDUSTRIAL
INSTITUTIONAL
MORE THAN 15% SLOPE
PUBLIC RECREATIONAL OPEN
FARMSTEAD
AGRICULTURAL OR VACANT LAND
LEGEND
FLOOD PLAIN OUTLINE 1 IN 100 YEAR FLOOD
FLOOD PLAIN OUTLINE 1 IN 100 YEAR FLOOD WITH ICE

c. Town Park - West Seneca - Upstream from Ridge Road there is a rather extensive flood plain area which is vacant and partially wooded. This area is presently zoned for residential and commercial uses. However, the ENCRPB Plan proposed a park at this location utilizing the flood plain on both sides of the stream, with access points from Seneca Street, Orchard Park Road, and East-West Road. Since portions of this flood plain have already been encroached upon, this area should receive high priority. The park would provide 200 acres of recreational area.

d. State Park - East of Northrup Road from Leydecker Road to the Town of Aurora is the most scenic and accessible reach of the Cazenovia Creek, consisting of a rugged gorge and heavily wooded areas. The ENCRPB Plan recognizes this recreation potential and proposes preserving open space throughout this section of Cazenovia Creek. The ENCRPB has suggested that this area receive major attention by the Niagara Frontier State Parks Commission. A State Park including a forest preserve should be developed in the form of a linear open space corridor extending from Leydecker Road to Willardshire Road near the Elma-Aurora Township boundary. A forest preserve is suggested between Leydecker and Northrup roads including an intensely developed park section along the creek. The plan proposes a continuation of the forest preserve upstream to the Aurora town line. Lands required for the forest preserves and intervening park section total almost 800 acres.

e. Town Park - East Aurora - A town park covering approximately 43 acres of land is proposed at the confluence of the East and West branches of Cazenovia Creek west of the Village of East Aurora.

f. Village Park - East Aurora - Within the Village of East Aurora immediately east of Mill Road the East Branch of Cazenovia Creek abruptly turns southward. The ENCRPB has proposed that the village purchase the 25 acre area within this meander and develop it as a village park.

g. Emery Park Extension - Emery Park is one of the most intensely used County parks at the present time and, with accessibility facilitated by means of the Aurora Expressway, usage will probably increase. To provide additional parklands with access to the creek, the ENCRPB has proposed that the 22 acres of land along the east bank of the stream extending south to Emery Road be purchased.

h. State Parks - Spring Brook Reservoir - Should a reservoir be constructed in the Spring Brook area, a State park bordering the reservoir has been suggested. The total area considered for parklands in this alternative amounts to 1,310 acres. With this plan, the parks discussed previously in (c), (e), and (f) above would be eliminated from the ENCRPB-proposed development.

2.146 Transportation

2.147 Improved Federal, State, County and town highways provide access to and within the Cazenovia Creek watershed. The Interstate Thruway, Aurora Expressway, Route 16, and Route 219 are the main arterials connecting the City of Buffalo to the outlying portions of the watershed. Union and Transit Roads are also important north-south thoroughfares. A line of the Baltimore and Ohio Railroad follows the upper valley of the West Branch in a north-south direction, a line of the LeHigh Valley Railroad crosses the basin in West Seneca, and lines of the Penn-Central Transportation Company Railroad cross the valley in north-south and east-west directions. Several commercial airlines serve the area from facilities at the Greater Buffalo International Airport in Cheektowaga, which is accessible from anywhere in the study area.

2.148 Environment in Vicinity of Proposed Ice Retention Structure

2.149 The ice retention structure would span Cazenovia Creek approximately 1,000 feet east of the Seneca Street-Main Street intersection in West Seneca. The immediate vicinity may be considered as the area between the West Seneca State School and Seneca Street, extending from the site of the ice retention structure east to the Leydecker Road bridge (see Plate 3). This area encompasses approximately 100 acres of lowlying floodplain, including 60-70 acres of completely undeveloped woody scrubland.

2.150 The open areas support many species of trees and woody shrubs. Dominant overstory tree species are black willow and eastern cottonwood, often associated with an understory of ironwood and boxelder. Common shrubs and herbaceous plants include wild grape, shrub willow, staghorn sumac, wild carrot, burdock, chicory, and mulberry. These scrublands provide habitats suitable for many of the smaller wildlife species found in the basin, including many small amphibians and reptiles, various songbirds, pheasant, cottontail rabbit, skunk, raccoon, opossum, and numerous small rodents.

2.151 Cazenovia Creek is wide and shallow in this area, with an average width of 150 feet and summertime depth certainly less than one foot. The bottom here is a pavement of friable dark grey shale interbedded with thin layers of limestone. The stream in this reach supports a variety of small minnows, frogs, and insect larvae.

2.152 Development in the vicinity of the proposed works is primarily residential, centered along Seneca and Leydecker Roads. Approximately 35 private residences are located here, with current market values ranging from $30-40,000. Two small farmsteads and approximately 20 acres of agricultural land are also located in the area. No industries or commercial enterprises are located here. An abandoned warehouse is situated alongside the creek near the Seneca Street-Leydecker Road intersection. Mill Road Park, the only park in West Seneca, is located about 1/2 mile west of the project site.

2.153 Data for 1970 Census Tracts which overlay the area reveal that residents are a mix of blue and white collar workers, including teachers and professionals. Levels of educational attainment and income are typical of the entire Town of West Seneca (see Table 27). No schools are located in the immediate area although East Senior High School, with a 1973 enrollment of 1916 students is situated approximately 1/4 mile north of Seneca Street.

2.154 Flooding Problem

2.155 This section presents a detailed history of flooding along Cazenovia Creek. Much of the data given here is the results of reconnaissance undertaken during or shortly after high water periods, and on a survey conducted in 1972 by the Corps of Engineers to determine damages within much of the study area. During the survey, residents were interviewed and information gathered pertaining to water elevations for varous floods, past damages, and projected future damages for floods of equal or greater magnitude. A search was made of newspaper files, historical documents, gage records, and other sources. Note, however, that no flood of 100-year or standard project magnitude has ever been recorded.

2.156 Existing Regulations

2.157 Implementation of flood plain management measures is the responsibility of local communities. New York State enabling statutes, which permit City zoning, specify (Chapt. 21, Art. 2-A, Sec. 24) that "such regulations shall be designed to secure safety from fire, floods, and other dangers, and to promote health and welfare." New York State Village Law (Chapt. 64, Art. 6-A, Sec. 177) provides for similar powers to villages, and Town Law (Chapt. 62, Art. 16, Sec. 263) states that "such regulations shall be made in accordance with a comprehensive plan and designed to lessen corjestion in the streets, to secure safety from fire, floods, panic, and other dangers, to promote health and general welfare." In addition, Sec. 277 concerning planning boards and official maps states that "land shown on such plots shall be of such character that it can be used safely for building purposes without danger to health or peril from fire, flood, or other menace."

2.158 Flood Insurance

2.159 Flood insurance, if established on a sound and equitable basis, could relieve the local financial burden of flood damages and provide another supplement to programs for reducing flood damage. However, insurance rates should realistically reflect the flood risk to discourage improper development of flood plains. A recently enacted amendment to the National Flood Insurance Bill, called the Flood Disaster Protection Act of 1973 (Public

Law 93-234), establishes a program of Federal assistance for flood insurance to be related to a unified national program for flood plain management. The program:

a. Substantially increases the limits of coverage authorized under the National Flood Insurance program.

b. Provides for the expeditious identification of, and the dissemination of information concerning floodprone areas.

c. Requires States or local communities, as a condition of future Federal financial assistance, to participate in the flood insurance program and to adopt adequate flood plain ordinances with effective enforcement provisions consistent with Federal standards to reduce or avoid future flood losses.

d. Requires the purchase of flood insurance by property owners who would be assisted by Federal programs or by Federally supervised, regulated, or insured agencies or institutions in the acquisition or improvement of land or facilities located or to be located in identifed areas having special flood hazards.

e. Areas identified to be floodprone areas must participate by 1 July 1975 in the flood insurance program or lose eligibility in Federally-funded projects that would be located in such areas.

2.160 Status of Flood Insurance Programs

2.161 Areas along Cazenovia Creek which have qualified at present for emergency flood insurance are:

a. Town of West Seneca

b. Town of Elma

c. Village of East Aurora

d. City of Buffalo

2.162 The most probable future role for flood insurance is in providing a useful means of accomplishing other programs which will reduce the risk to a point where insurance is economically feasible. Flood insurance is not a complete solution to flood problems, but a possible means of providing the difference between partial flood protection and complete coverage against loss of structures already within the flood plain.

2.163 Flood Warning and Forecast Services

2.164 No flood warning or forecast services are presently available to residents of Cazenovia Basin despite its floodprone history. In a 1973 study of flood and erosion damage downstream of Cazenovia Park commissioned by the City of Buffalo, DeLeuw-Cather and Company recommended that such services be implemented with all speed. They present an empirically derived statistical method which would predict damaging flood stages on the basis of readily available meteorological and hydrological data.

2.165 Status of Existing Plans and Improvements

2.166 Various improvements to Cazenovia Creek and Tannery Brook have been made both by Federal and local authorities with a view to providing flood protection at different locations. Reference to Plates 1 and 2 will aid the reader during the discussion of these improvements.

2.167 The City of Buffalo is involved in a program of removing willow trees from the banks of the creek downstream of Cazenovia Street bridge and lining the banks with concrete slope walls. This program was initiated in 1960 and is planned to be continued in the future. The intent of the program is to reduce the friction along the creek banks to improve the hydraulic efficiency of the channel and to allow the ice to flow freely through this reach.

2.168 In the vicinity of Cazenovia Street bridge, vertical retaining walls have been constructed on both banks over a distance of 1,300 feet. A three foot high concrete dam originally constructed to maintain a recreational pool in Cazenovia Park was removed by the City of Buffalo in the winter of 1964-1965.

2.169 In 1960, the City constructed a levee along the left bank from Cazenovia Street to Green Road to prevent overbank flows in this reach. However, because the levee reduced valley storage and interferred with ice flow movement, the City removed the levee in 1965 and constructed a new levee set back from the bank. A levee along Beyer Street on the right bank was constructed in 1964.

2.170 Since 1963, the City of Buffalo has maintained an ice patrol on Cazenovia Creek. The main objective of this patrol is to report on ice breakup conditions in the creek and help prevent ice jams within the City limits. Amphibious vehicles break up the ice cover in the lower reaches of the creek to help the ice enter the Buffalo River and flow into Lake Erie.

2.171 In 1947, the Corps of Engineers conducted a clearing and snagging project between Ridge Road and Mill Road at a cost of $24,900.

2.172 In 1971, the Corps of Engineers completed a snagging and clearing project in West Seneca upstream of Cazenovia Park at a cost of $44,000. This program included the removal of sand bars in the reach between the New York State Thruway and a point about 1,500 feet above Mill Road.

2.173 Above Ridge Road the creek is contained on the left bank by a 30-foot high bluff. The right banks from Union Road bridge to a point 900 feet downstream was raised and protected by concrete bag riprap in 1960. A partial levee was constructed by a developer in 1963 extending for 600 feet from Sunbriar Drive towards Parkside Drive. Natural weathering and flooding have destroyed this levee. Riprap has been placed along the foot of the bank in various locations from Ridge Road to a point upstream of Mill Road by the Soil Conservation Service. In addition, some channel improvement was carried out by the Corps of Engineers in the middle of this reach in 1970.

2.174 Upstream of Mill Road, improvements have been confined to measures taken by local agencies to conteract specific problems within their areas of jurisdiction. From Mill Road to the confluence of the East and West Branches of Cazenovia Creek near East Aurora, the creek is contained in a gorge and flood protection is not necessary. The Towns of Aurora and Colden have on various occasions carried out channel improvements along stretches of the creek. These improvements have included the removal of gravel bars restricting flow through various sections and causing bank overtopping.

2.175 SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek). The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties, SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities.

2.176 In the West Branch, there have been no significant flood control improvements along the creek.

2.177 Flood control measures along Tannery Brook have included clearing and snagging in 1959 and replacement of two East Aurora bridges (Maple Road and Pine Street) in 1963. During recent winters, the Village of East Aurora has discharged backwash water into the brook from Water Treatment Plant softeners to prevent formation of ice. The village has also used an ice-breaking technique similar to that used by the City of Buffalo in order to keep the channel clear. These measures have proved reasonably effective.

2.178 Flood Stages and Discharges

2.179 According to records, flooding took place in February and March 1904, January 1929, March 1942, March 1955, March 1956, January 1959, January 1962, March 1964, February 1965, December 1969, January 1970 and March 1972.

The maximum discharge on record is 13,500 cfs occurring during the flood of March 1955. Because of ice jams, flood stages along Cazenovia Creek are often produced by discharges which would be non-damaging under free-flow conditions. This is best exhibited by the flooding which occurred during January 1962, when a maximum discharge of 5,400 cfs was recorded, although the maximum stage on the Ebenezer gage was listed as 11.33 feet. Table 31 shows data for annual maximum instantaneous discharges and stages of the creek at the Ebenezer gage from 1941 to 1972. All elevations in this report are based on the United States Coast and Geodetic Survey (U.S.C. & G.S.) datum.

Table 31

Annual Maximum Instantaneous Discharges and Stages of Cazenovia Creek (U.S.G.S. Gage at Ebenezer)

ANNUAL MAXIMUM INSTANTANEOUS DISCHARGE				ANNUAL MAXIMUM INSTANTANEOUS STAGE		
WATER YEAR	DATE	DISCHARGE c.f.s.	GAGE HEIGHT ft. (1)	DATE	ADJUSTED DISCHARGE c.f.s.(2)	GAGE HEIGHT ft. (1)
1941	Apr 5	6,820	11.95	Apr 5	6,820	11.95
1942	Mar 17	11,200	15.11	Mar 17	11,200	15.11
1943	Apr 28	6,600	11.85	Apr 28	6,600	11.85
1944	Jun 24	8,490	13.28	Jun 24	8,490	13.28
1945	Mar 3	5,070	9.61	Feb 22	2,100	12.20 (5)
1946	Oct 2	9,530	14.05	Jan 5	4,000	14.41 (5)
1947	Apr 5	9,210	13.02	Apr 5	9,210	13.02
1948	Feb 19	5,220	9.75	Feb 19	5,220	10.20 (5)
1949	Jan 5	4,770	9.36	Jan 5	4,770	9.87 (5)
1950	Mar 27	6,480	10.85	Mar 27	6,480	10.85
1951	Jan 4	7,330	11.56	Jan 4	7,330	11.56
1952	Mar 11	6,510	10.64	Mar 11	6,510	10.64
1953	May 26	7,110	11.14	May 26	7,110	11.14
1954	Mar 25	5,570	10.02	Mar 25	5,570	10.02
1955	Mar 1	13,500	15.82	Mar 1	13,500	15.82
1956	Mar 7	13,000	14.65	Mar 7	13,000	14.65
1957	Jan 22	12,100	14.09	Jan 22	12,100	14.09
1958	Jun 13	4,610	8.72	Jun 13	4,610	8.72
1959	Jan 22	12,600	14.40	Jan 22	12,600	14.46 (5)
1960	Mar 30	7,160	10.82	Mar 30	7,160	10.82

Table 31 (Cont'd)

ANNUAL MAXIMUM INSTANTANEOUS DISCHARGE				ANNUAL MAXIMUM INSTANTANEOUS STAGE		
WATER YEAR	DATE	DISCHARGE c.f.s.	GAGE HEIGHT ft. (1)	DATE	ADJUSTED DISCHARGE c.f.s.(2)	GAGE HEIGHT ft. (1)
1961	Apr 25	7,910	11.37	Apr 25	7,910	11.37
1962	Jan 27	5,400	10.39	Mar 12	5,000(3)	11.33 (5)
1963	Mar 17	5,980	9.91	Mar 17	5,980	9.91
1964	Mar 5	6,940	10.65	Mar 5	6,940(4)	10.65 (5)
1965	Feb 8	4,070	8.20	Feb 8	4,070	11.28 (5)
1966	Feb 11	4,160	8.29	Feb 11	4,160	9.34 (5)
1967	Sep 29	8,020	11.45	Sep 29	8,020	11.45
1968	Jan 30	4,770	8.86	Jan 30	4,770	8.86
1969	Dec 28	6,910	10.63	Dec 28	6,910	10.63
1970	Apr 2	6,050	9.97	Apr 2	6,050(4)	9.97
1971	Nov 28	5,110	9.17	Feb 27	4,200	9.34 (5)
1972	Jun 23	12,300	13.53	Jun 23	12,300(4)	13.53

(1) Elevation of gage zero: 604.86

(2) Values used in developing stage-discharge and stage-frequency relationships for ice-affected flow at each index point.

(3) From U.S.G.S. Water Supply Paper 1677

(4) Instead of this value, the following value of ice-affected discharge having occurred the same year was used in developing stage-discharge and stage-frequency relationships for ice-affected flows at the specified index point(s).

DATE	ADJUSTED DISCHARGE	INDEX POINT
25 January 1964	3800	3B
29 January 1970	3090	3B and 3C
2 March 1972	9800	3B

2.180 Notatable Storms

2.181 General climatological information for Cazenovia Creek basin is discussed in Section 2 of this report. Specific meteorological events which resulted in flooding conditions in the basin are discussed in this section.

2.182 Storms which resulted in major floods along the creek occurred in June 1937, March 1942, March 1955, March 1956, January 1959, January 1970, and March 1972. Some of these are discussed below.

2.183 On 1 March 1955, a thunderstorm caused heavy rains to fall on frozen ground for a period of six hours. Only a trace of snow was reported on the ground on the days preceding this storm. The storm caused the maximum recorded discharge on Cazenovia Creek, 13,500 cubic feet per second (cps).

2.184 On 20 January 1959, a major storm system developed over the central and south central states and moved northeastward bringing heavy rainfall over Western New York on 21 January. Due to a heavy snow cover (9 inches) runoff was again augmented by snowmelt and frozen ground conditions. On 21 and 22 January the snow melted rapidly due to heavy rainfall and temperatures in the 50's. Flood conditions were further aggravated when high flows broke up the thick ice cover on the stream. Numerous ice jams occurred along the creek, especially near Cazenovia Street bridge, Buffalo and West Willowdale Drive and Parkside Drive, West Seneca.

2.185 On Wednesday morning, 1 March 1972, a low pressure system moved into the western Great Lakes region. A warm front extended eastward from the low center through Western New York near the Pennsylvania border. With temperatures in the 50's and moderate rainfall, high runoff occurred. The resulting high flows caused the ice cover on the creek to break up. An ice jam occurred just upstream of the Ridge Road Bridge extending approximately to the Union Road bridge, causing widespread flooding in West Seneca.

2.186 The magnitude of flooding affected by ice jamming on 22 January 195 warranted a detailed field survey to obtain high-water-mark data and determine the extent of flooding. An analysis of these data and data gathered during other floods indicated that the stages of the 1959 flood were the maximum of record throughout most of the study area. Sufficient high-water-mark data from the 1959 flood were available to adequately reconstruct the flood surface profile. This profile was used as a pattern to develop the 100-year profile used in the analysis and sizing considered local protection measures. High-water-mark data for known ice affected flows were used in developing stage-discharge and stage-frequency relationships discussed below.

2.187 Discharge-Frequency Relationships

2.188 The discharge-frequency analysis for the creek at the Ebenezer gage was based on annual maximum instantaneous discharge data shown in Table 31. These data, published by the U.S.G.S., were gathered at the Ebenezer gage over a period of 32 years. The discharge values presented were obtained through use of a continually updated rating curve. Stages are recorded continuously and the resulting continuous hydrograph is used with the rating curve to determine average daily, annual maximum, and annual minimum instantaneous discharges. Values obtained by use of this method are accurate in summer, but less accurate during winter and spring due to backwater effects of floating ice and ice jams. The U.S.G.S. data have been adjusted to reflect the effects of ice on measured stages and, consequently, published flows. The stage values of the continuous stage-hydrograph for a known ice affected flow are adjusted to reflect stages the same flow probably would have caused if it had not been affected by ice. Several factors were considered in adjusting the recorded values, including base flow, air temperature, precipitation, snow cover, flow at other nearby gaging stations, and, sometimes, discharge measurements made during an event.

2.189 The discharge-frequency relationship for the creek at the Ebenezer gage was established through a log-Pearson, Type III, distribution analysis in which the annual maximum instantaneous discharges for the period of record were used. The relationship, shown by the curve on Plate 19, indicates that there is a one percent chance that a discharge of 16,800 cubic feet per second will be exceeded in any one year. Over a long period, a flow of 16,800 cubic feet per second will occur on the average of once every 100 years at the Ebenezer Gage. For comparison, the discharge values used in the distribution analysis were plotted on Plate 19 using Beard's plotting position method.

2.190 Stage-Discharge Relationships

2.191 To facilitate the flood damage analysis and evaluation of alternative flood management measures, the primary flood damage area, located in the lower part of the basin, was divided into three reaches based on differences and similarities in hydraulic characteristics, land uses, flood mode, etc. Each of these reaches was subdivided further, and each subreach represented during hydraulic analyses by an individual index point. Table 32 and Plate 2 locate each subreach and index point. Stage-discharge relationships for free flow, shown on Plate 20 were developed for each index point from water surface profile computations using computer program 22-52-L232, Water Surface Profiles, developed by the Engineering Center at Davis, CA. The computational procedure is similar to Method I presented in Appendix III of EM 1110-2-1409 entitled Backwater Curves in River Channels, dated December 1959. Known discharges from the Ebenezer gate were backwatered upstream and resultant stages were correlated with known high-water-mark data and the gage rating curve to model the flow regime of the creek.

2.192 Assumed stage-discharge relationships for ice affected flow, shown on Plate 20, were developed in the following manner. For each index point the elevation of the surface of each ice affected flow (the elevation of the U.S.G.S. Ebenezer gage zero plus the stage at that point) was plotted as a function of the adjusted discharge value for that flow. Smooth curves were then fitted through the so-plotted points for each index point. Reach 1A is unaffected by ice jams primarily because the City of Buffalo, by use of amphibious vehicles, continually breaks ice cover on the Buffalo River and Cazenovia Creek. Therefore, a curve to show the ice affected stage-discharge relationship for the creek at index point 1A was not developed.

2.193 Stage-Frequency Relationships

2.194 Stage-frequency relationships for free flow were developed by use of discharge-frequency and stage-discharge relationships, while these for ice-affected flows were developed in the following manner. The adjusted values of those discharges which caused the annual maximum instantaneous stages shown in Table 31 were used with the stage-discharge curves for each index point to obtain the surface elevation of each flood of record at each index point. The surface elevations of floods affected by ice were obtained from the estimated ice rating curve. The surface elevations of floods not affected by ice were obtained from the free flow rating curve. For each index point, the so-obtained values of flood elevations for the period of record were ranked in descending order and plotted using Beard's plotting position method. Curves were then fitted through these plotted points. These curves are shown on Plate 21 for both ice affected and free flow conditions.

2.195 Stream Velocities

2.196 The relatively low flows occurring in Cazenovia Creek during the winter months permit an ice cover to form over large stretches of the creek. The water then continues to flow under the ice and, provided the flow remains reasonably constant, no change in the ice cover takes place. However, a sudden increase in flow caused by runoff from snowmelt or precipitation disturbs this stable condition. Ice starts to break up and travel downstream. The free ice is unable to pass under the stable cover in downstream reaches where the velocity is lower, causing ice jams. The temporary damming effect might increase stages to the extent where overtopping of the banks and local flooding can occur.

Table 32

Subreaches and Index Points For Lower Basin

Subreach	Downstream and Upstream Limits	Index Point Location
	Confluence with Buffalo River	
1A		Sta. 0+00, confluence with Buffalo River
	Cazenovia Street Bridge	
1B		Sta. 82+00, downstream of Green Road Bridge
	New York State Thruway Bridge	
2A		Sta. 130+00, upstream of NY State Thruway Bridge
	Orchard Park Road Bridge	
2B		Sta. 211+50, downstream of Ridge Road Bridge
	Ridge Road Bridge	
3A		Sta. 214+00, upstream of Ridge Road Bridge at Ebenezer Gage.
	Downstream of Parkside Drive (West Seneca)	
3B		Sta. 273+50, downstream of Southgate Plaza
	Downstream edge of Southgate Plaza	
3C		Sta. 308+00, downstream of Mill Road Bridge
	Upstream of Mill Road Bridge	

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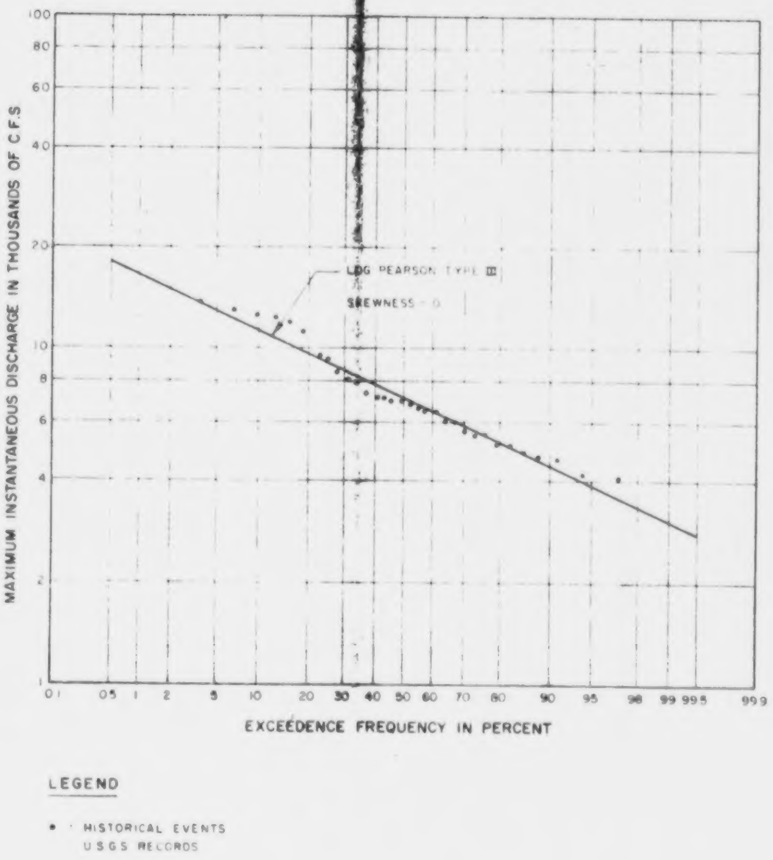

CAZENOVIA CREEK NEW YORK

DISCHARGE-FREQUENCY
CURVE FOR
CAZENOVIA CREEK
AT EBENEZER GAGE

US ARMY ENGINEER DISTRICT, BUFFALO

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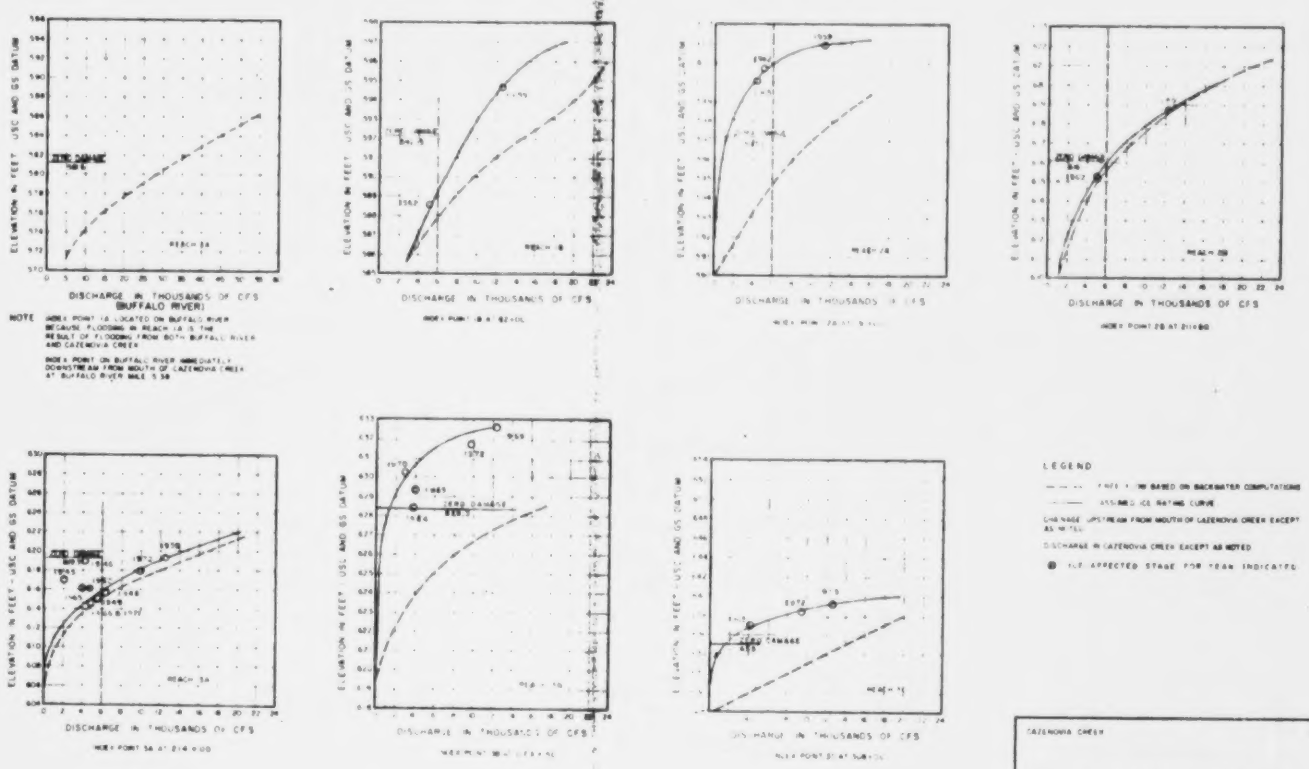
PLATE 18



NOTE INDEX POINT 1A LOCATED ON BUFFALO RIVER BECAUSE FLOODING IN REACH 1A IS THE RESULT OF FLOODING FROM BOTH BUFFALO RIVER AND CAZENOVIA CREEK

INDEX POINT ON BUFFALO RIVER IMMEDIATELY DOWNSTREAM FROM MOUTH OF CAZENOVIA CREEK AT BUFFALO RIVER MILE 5.38

LEGEND

– – – FREE FLOW BASED ON BACKWATER COMPUTATIONS

——— ASSUMED ICE RATING CURVE

CHAINAGE UPSTREAM FROM MOUTH OF CAZENOVIA CREEK EXCEPT AS NOTED

DISCHARGE IN CAZENOVIA CREEK EXCEPT AS NOTED

● ICE AFFECTED STAGE FOR YEAR INDICATED

CAZENOVIA CREEK NEW YORK

STAGE–DISCHARGE CURVES
FOR CAZENOVIA CREEK
U.S. ARMY ENGINEER DISTRICT, BUFFALO

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PLATE 20

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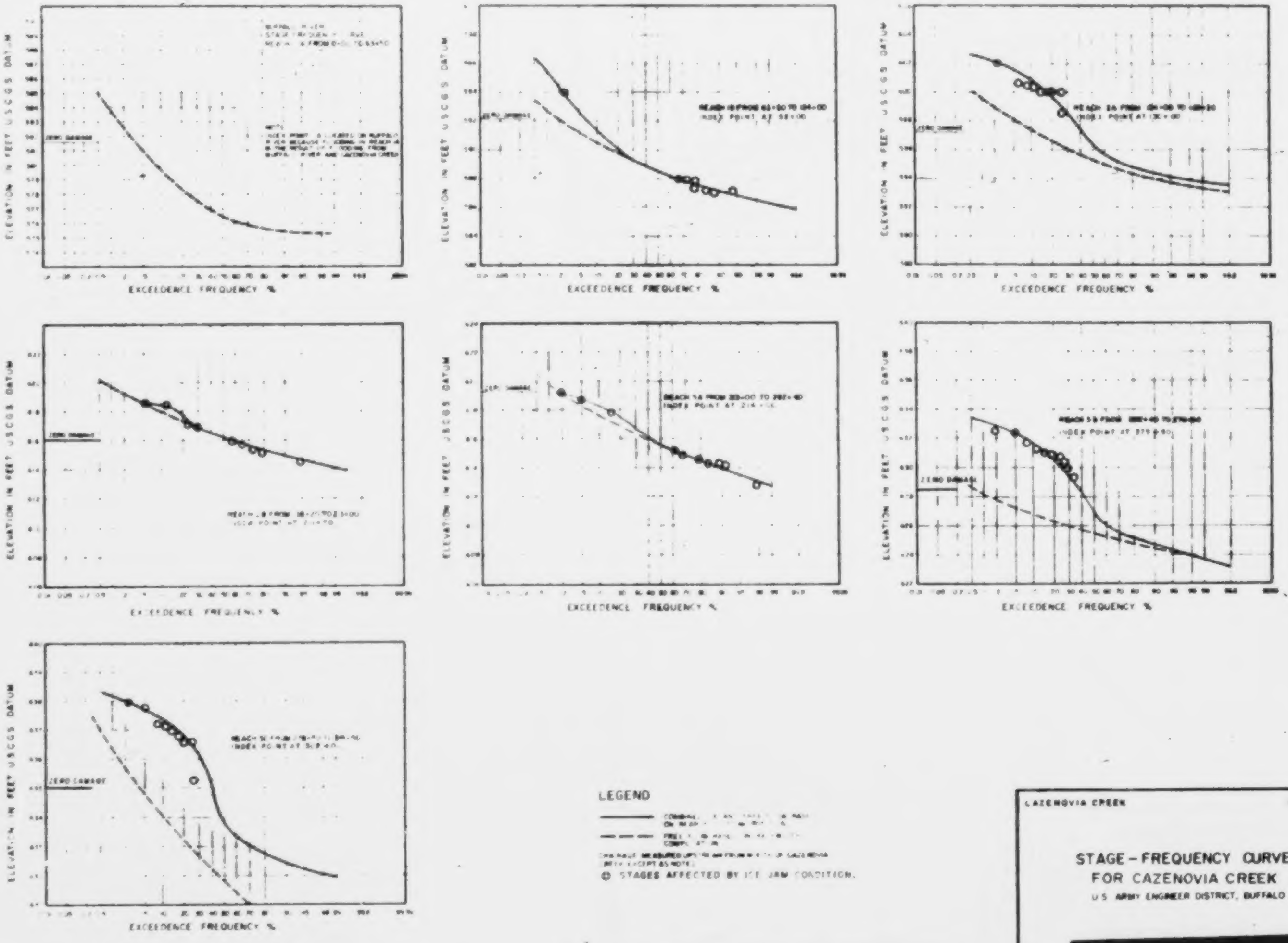


CAZENOVIA CREEK NEW YORK

STAGE-FREQUENCY CURVES FOR CAZENOVIA CREEK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

2.197 Past experience has indicated that a stable ice cover can form and be maintained on a stream of this type when velocities do not exceed 2.25 feet per second (fps). Velocity profiles for various discharges along the lower portion of Cazenovia Creek were determined by using the Corps of Engineers HEC-2 Backwater Program. The velocity profiles for flows of 500 cfs, 1,000 cfs, and 2,000 cfs are indicated on Plate 22. These profiles indicate that in several reaches of Cazenovia Creek the velocity can be maintained below 2.25 fps for discharges in the range of 500 to 1,000 cfs. Considerations of this type are critical in the design of reservoirs to control flow during the critical winter months, encouraging the formation of a stable ice cover.

2.198 Unit Hydrograph

2.199 Unit hydrographs were developed from data obtained at the Ebenezer gage using actual streamflow and climatological data. Storms used in the study were selected on the basis of the following criteria:

a. known uniform rainfall and distribution;

b. unfrozen ground preceding the rainfall; and

c. a bank-full peak stage.

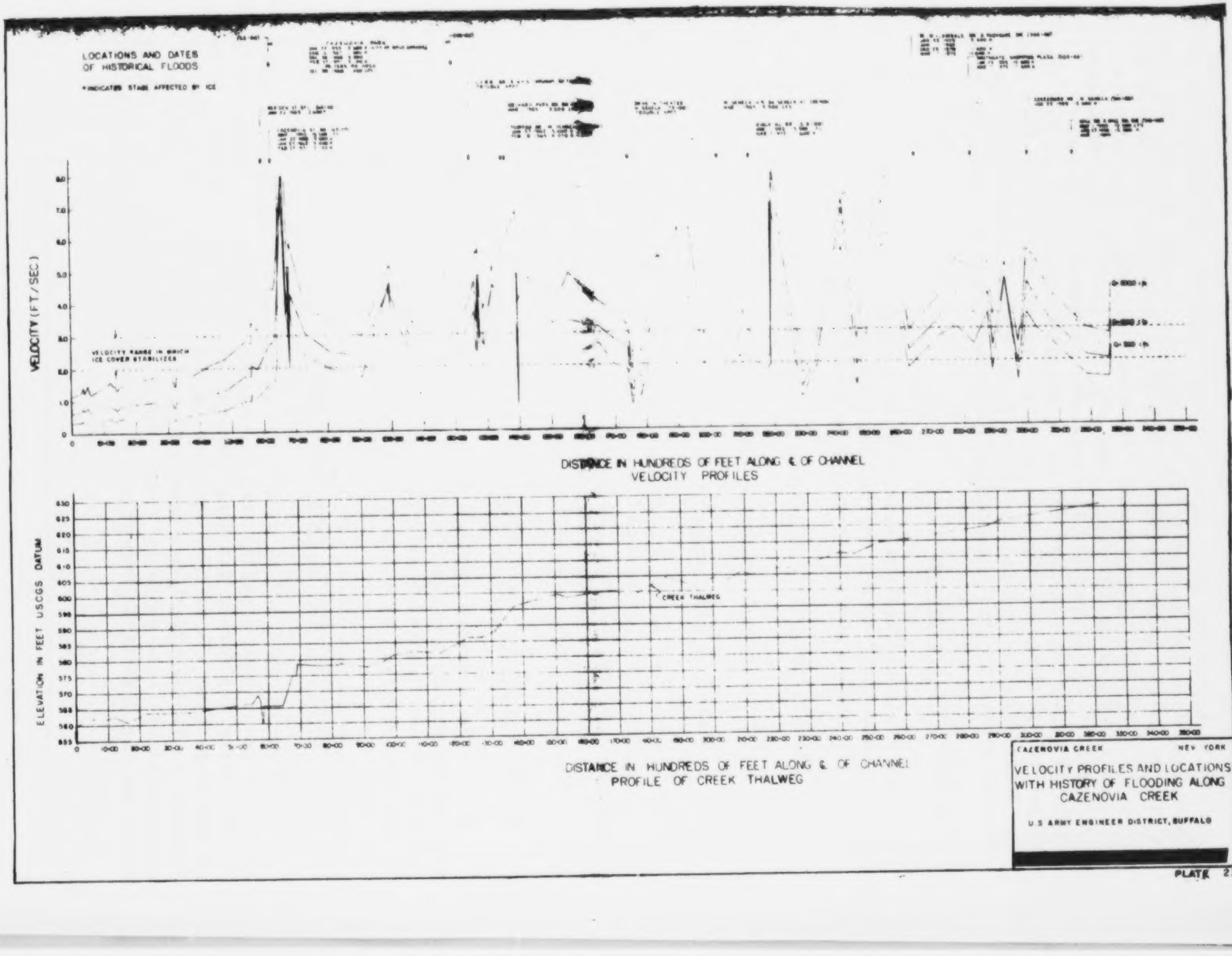
Two storms, one in June 1944 and the other in October 1945, met the criteria and were used. A unit hydrograph was derived from each storm, then checked by reproducing the actual hydrograph from the other storm. From these two unit hydrographs, an average unit hydrograph was developed and is shown with Snyder's coefficients on Plate 23.

2.200 Standard Project Flood

2.201 The standard project flood hydrograph was derived using USCE Engineering Manual No. 1110-2-1411 "Standard Project Flood Determinations," and Hydrometeorological Report No. 33. The standard project flood of 77,000 cfs, approved by OCE 1 May 1973, was used for design purposes in this study.

2.202 Hydrology for Tannery Brook Basin

2.203 Although flooding occurs almost annually along Tannery Brook, there has never been a gaging station on this tributary of Cazenovia Creek, nor are there any stream discharge records or stage measurements. This may be due in part to the small (2.8 square miles) drainage area of the brook. Flooding on Tannery Brook has been analyzed by using high-water-marks established by field surveys. These surveys indicate that the March 1955 flood was the highest in recent years, although a flood in the 1930's was

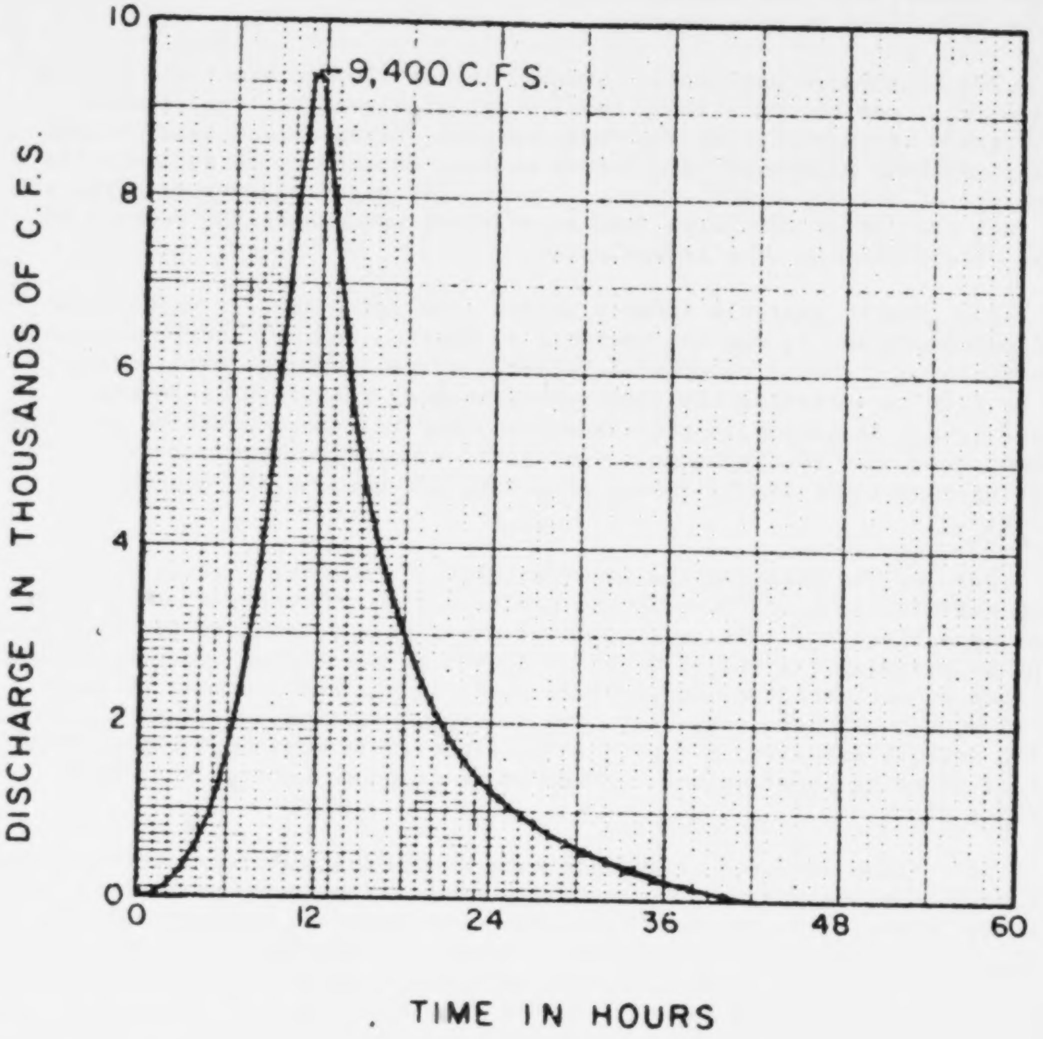


CAZENOVIA CREEK NEW YORK

VELOCITY PROFILES AND LOCATIONS
WITH HISTORY OF FLOODING ALONG
CAZENOVIA CREEK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 22



NOTES

D A = 136 SQ MI
C_t = 1.43
$640C_p$ = 693

CAZENOVIA CREEK NEW YORK

3-HOUR UNIT HYDROGRAPH
FOR CAZENOVIA CREEK AT
EBENEZER

U.S. ARMY ENGINEER DISTRICT, BUFFALO

probably higher. There were indications that ice jams raised the stages of the January 1959 and February 1961 floods to the water surface profile of the 1955 flood in some reaches.

2.204 The large population turnover in the flooded area, the effects of ice jams, and the relatively small range of elevations complicated the problem of establishing high-water-marks. Slope-area determinations utilizing these high-water-marks were made in an attempt to estimate the discharge of the March 1955 flood. Due to some vague high-water-marks and the fact that water overflows into an adjacent watershed, the results of these determinations were inconclusive.

2.205 Due to variable effects of ice jams and generally vague data on flood profiles, it was not possible to develop reliable stage-discharge relationships. In the absence of reliable stage-discharge data, there was no need to determine the discharge-frequency relationship in the damage area. Stage-damage and stage-frequency relations would be developed without reference to discharge. Therefore, stage-discharge curves for existing conditions in the damage area were not used in the economic analysis.

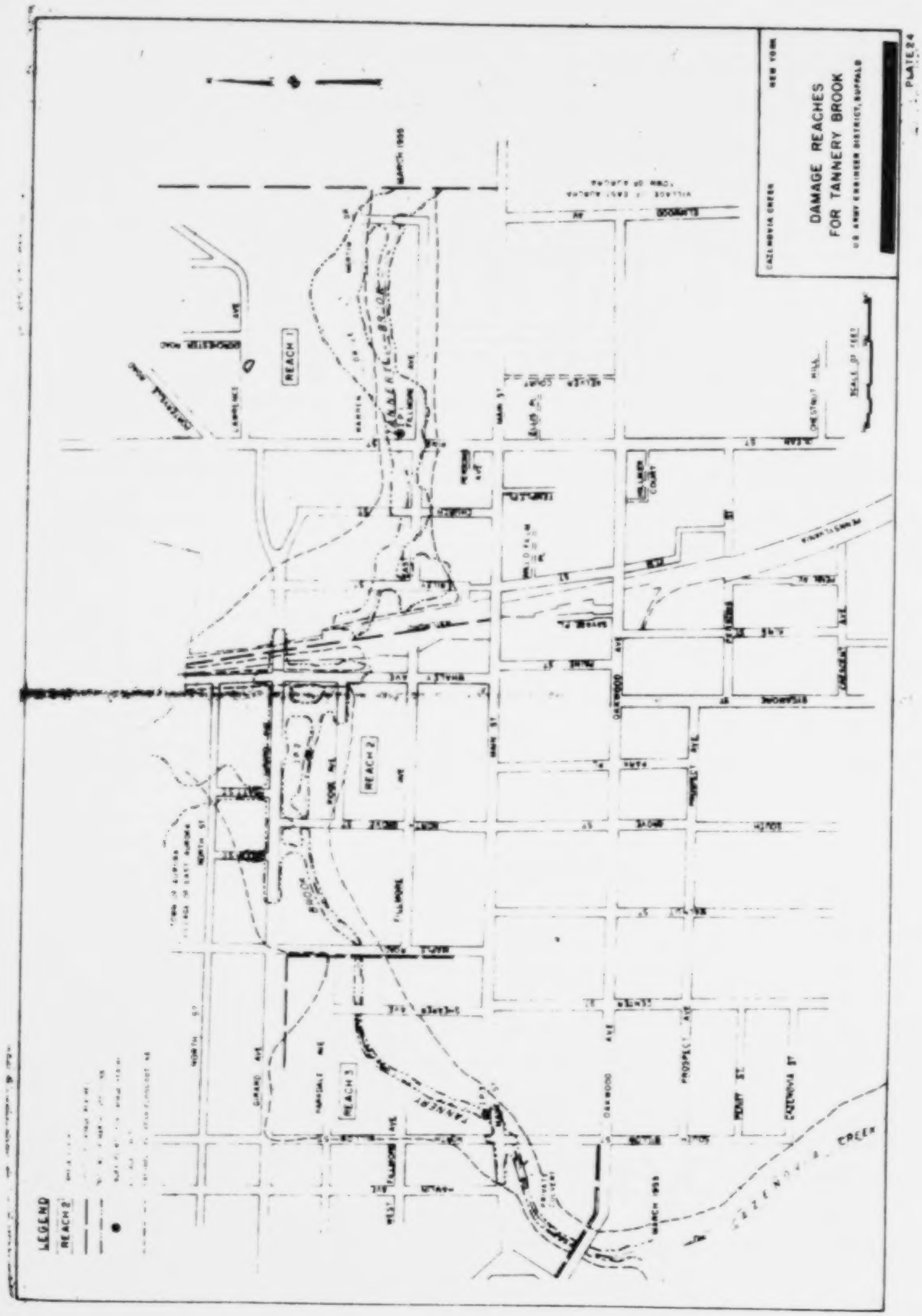
2.206 As was done for the lower portion of Cazenovia Creek, Tannery Brook was divided into three damage reaches, each represented by an index point (see Plate 24). Stage-frequency curves were determined for each index point by arraying the stages of known floods in descending order and assigning each an estimated return interval based on the known number of years the flood had not been exceeded. The plotting position was then calculated by the Weibull equation, $P = m/(n + 1)$, since it is more conservative than Beard's plotting point method. These stage-frequency curves are shown on Plate 25.

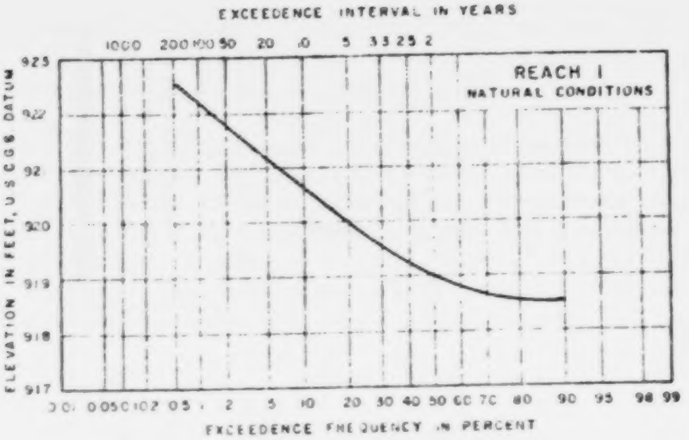
2.207 Since no stream flow data were available, development of a unit hydrograph was accomplished by synthetic means. Necessary parameters, such as Snyder's coefficients, were available from previous studies made on Cayuga, Buffalo and Cazenovia Creeks. After calculating the maximum ordinate and time of runoff by three different methods, it appeared the best results were obtained when using Snyder's method (see Plate 26.)

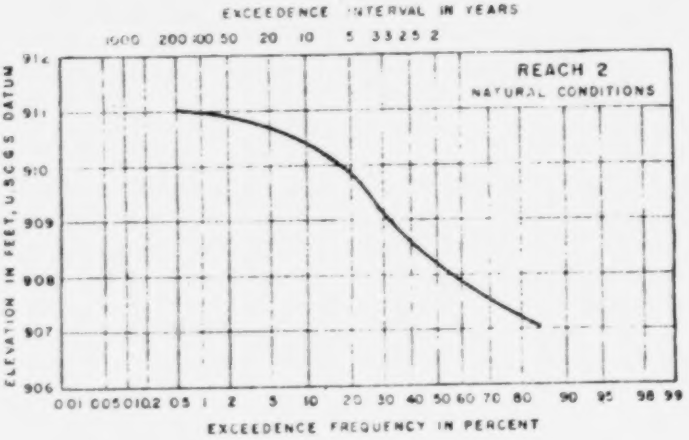
2.208 For the standard project flood, rainfall excesses as indicated by the Engineering Manual No. 1110-2-1411, Standard Project Flood Determinations (formerly C.W.I. 52-8) were applied to the synthetic unit hydrograph. The result was a hydrograph with a peak flow of 4,900 cfs.

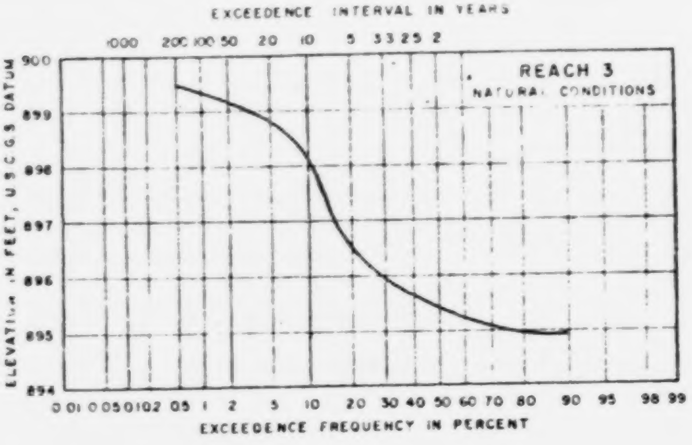
2.209 Present Flood Damages

2.210 Both tangible and intangible damages and losses are experienced during flooding along Cazenovia Creek. Tangible damages and/or losses include: physical damage to flooded structures, utilities, and transportation


CAZENOVIA CREEK
NEW YORK
DAMAGE REACHES
FOR TANNERY BROOK
U.S. ARMY ENGINEER DISTRICT, BUFFALO
PLATE 24
LEGEND
REACH 2
REACH 1
REACH 2
REACH 3
TANNERY BROOK
CAZENOVIA CREEK
MARCH 1959
PRIVATE CULVERT
NORTH ST
GRAND AVE
OAKWOOD AVE
PROSPECT AVE
PERRY ST
CAZENOVIA ST
MAIN ST
FILLMORE AVE
PARK AVE
LAWRENCE AVE
DORCHESTER ROAD
CHESTNUT HILL
SCALE OF FEET
TOWN OF AURORA
VILLAGE OF EAST AURORA





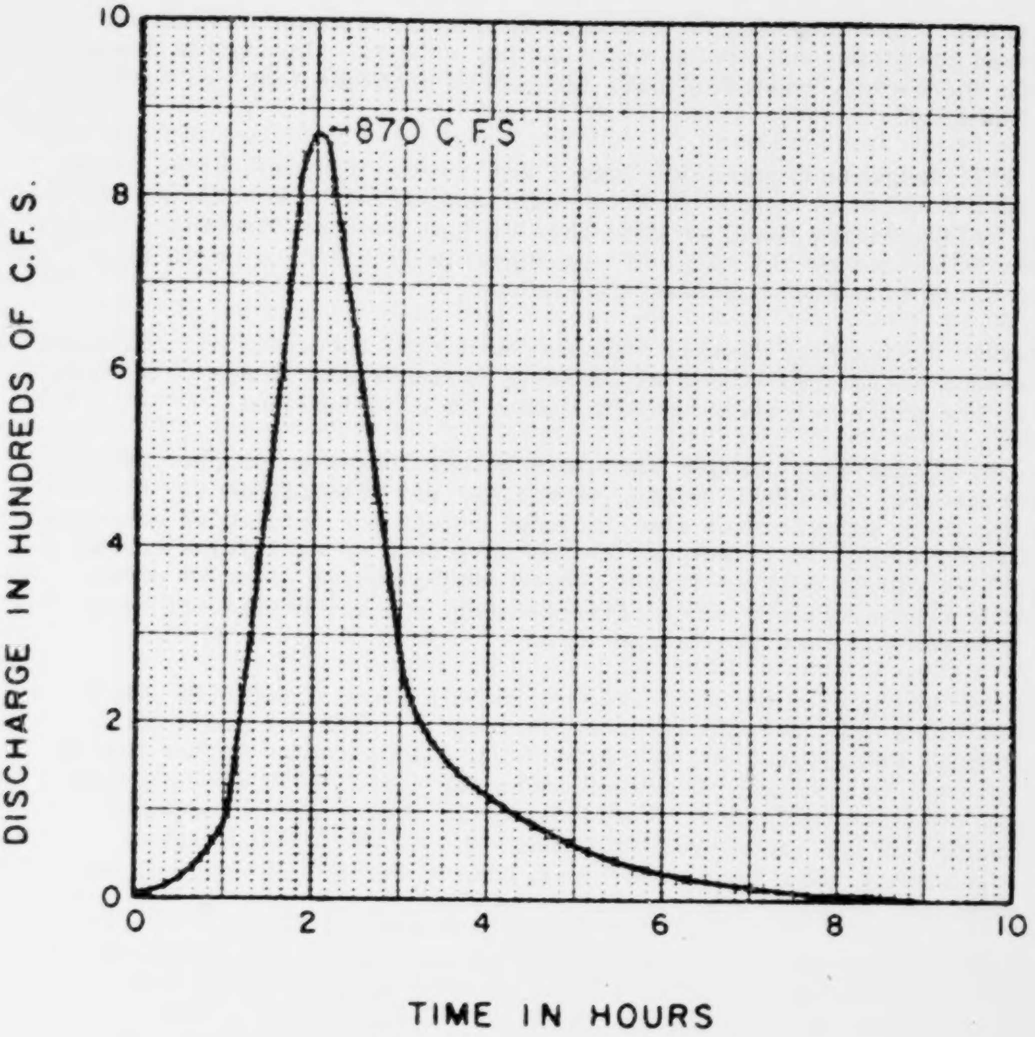


CAZENOVIA CREEK NEW YORK

STAGE-FREQUENCY CURVES FOR TANNERY BROOK

U S ARMY ENGINEER DISTRICT, BUFFALO

PLATE 25



NOTES

D.A. = 2.2 SQ. MI.
C_t = 1.00
640Cp = 600

CAYUGA, BUFFALO, AND CAZENOVIA CREEKS
SYNTHETIC
1-HOUR UNIT HYDROGRAPH
FOR TANNERY BROOK
NEAR EAST AURORA
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 26

facilities; flood-fighting costs; cleanup costs; business losses; and increased operating and living costs during a flood. Intangible losses include the social, psychological, and health problems that are associated with flooding.

2.211 Tangible damages and losses for the major damage areas along the lower portion of Cazenovia Creek were quantified by developing stage-damage relationships based on data from various sources, including damage surveys conducted by the Corps of Engineers in 1960 and twice in 1972. The damage categories used are described below.

2.212 Residential damages include inundation losses to all residences and appurtenant structures including building contents and damage to grounds. Cost of emergency quarters due to flooding is also included.

2.213 Commercial damages include physical losses to properties and facilities used for retail trade, servicing, and entertainment. All other business pursuits are also included except for industrial activity. In addition to physical damages, losses sustained by activities consequential to floods such as loss of wages and increased costs of normal operation resulting from evacuation, cleanup, and reinstallation were also incorporated into the damage survey.

2.214 Industrial physical damages include flood damages to properties and facilities used in manufacturing, extracting, utility production, warehousing, transportation, and production distribution. Other losses include costs in addition to normal operating costs, such as evaluation cleanup, and reinstallation. Wage and profit losses sustained were also incorporated in the damage survey. However, due to the scarcity of industrial areas along Cazenovia Creek, this category was combined with the commercial category and considered as one.

2.215 Public and other damages include all costs associated with physical flood losses to public facilities such as schools, and municipal buildings as well as plant facilities such as sewer, water, road, and park systems. Other losses to the public include additional costs incurred during flood emergencies such as evacuation and reoccupation; flood fighting; disaster relief, and extra duty for police, fire and martial units.

2.216 Note that care has been taken to exclude non-recurring flood damages (i.e.; destruction of a building which is not replaced) from primary flood damage compilations and the resulting average annual damages. The results of this survey were used to develop the stage-damage relationship for each subreach at its selected index point (Plate 27). Table 33 presents data developed by combining the curves in Plate 27 with appropriate stage-discharge and discharge-frequency relationships. A similar analysis conducted for Tannery Brook using stage-damage relationships based on damage surveys by the Soil Conservation Service in 1956. This damage survey data was updated for recent developments and adjusted to present price levels. These results are shown on Plate 28 and in Table 34.

2.217 Extent and Characteristics of Flooded Area

2.218 Most large runoff events along Cazenovia Creek are caused by runoff from rapid thawing of snow cover in spring coupled with rainfall. The steeply sloping terrain in the upper watershed and the steep thalweg of the creek cause rapid runoff and abruptly fluctuating flows as shown by the unit hydrograph. The upper portion of the basin experiences comparatively little flooding and, when flooding does occur, the limited development results in relatively few flood damages. By contract, in the lower portion of the basin, flat slopes, low channel banks, restricted and meandering channels, and constricted bridge openings result in considerable flooding, which causes substantial damages to the extensive residential and commercial developments. Ice jamming further reduces channel capacity in the lower basin and contributes to flooding. The worst flooding occurs in the reach from downstream of the Cazenovia Street Bridge in Buffalo to upstream of the Mill Road Bridge in West Seneca. Flooding along Tannery Brook causes damages in East Aurora.

2.219 As discussed previously, the primary damage area, located in the lower basin, was divided into reaches and subreaches (see Table 32 and Plate 2) to facilitate flood damage analyses. Subreach 1A extends from the Buffalo River to Cazenovia Street Bridge. The most damaging flood of record in this reach occurred in 1959. Extensive damage occurred to residential development on the left floodplain between Portland and Cazenovia Street. Basement flooding due to overland flow and storm sewer backup is a frequent occurrence. In this subreach, a discharge with a 100-year recurrence frequency would affect 1516 residential units, including first-floor flooding; 108 commercial units, with first-floor flooding; and 10 public and other units, three of which would experience first-floor flooding.

2.220 Subreach 1B extends from the Cazenovia Street Bridge to the New York State Thruway and includes Cazenovia Park. The 1959 flood resulted in an average depth of three feet on Abbott Road between Cazenovia Street and Potters Road. Located within this area and on the south side of Abbott Road are residential developments, a hospital, and a school. Except for residential developments between Woodside and Brookside Avenues north of Potters Road, the area of this subreach between Cazenovia Creek and Abbott and Potters Road is undeveloped and, therefore, the average annual damages are small.

2.221 Residences on Beyer and Willink Streets and Wildwood Avenue residence yards just downstream of the Lehigh Valley Railroad have been damaged by flooding. In this reach, the 100-year flood would affect 212 residential and 20 commercial units, causing first-floor flooding in eight of the commercial units.

Table 33

Stage-, Discharge-, and Frequency-Damage Data
For Cazenovia Creek Subreaches Under Existing Conditions

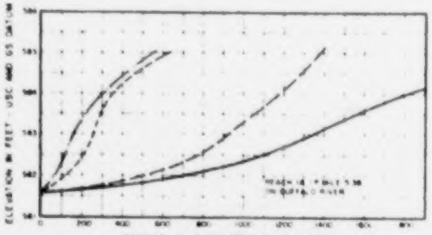
Subreach Index Point	Elevation at which Flood Damages Begin, Ft. Above Sea Level	Free Flow Conditions					
		Maximum Nondamaging Discharge, cfs	Average Return Period Between Damaging Floods, Years	Total Average Annual Flood Damages $/Year (1)	Maximum Nondamaging Discharge, cfs	Average Return Period Between Damaging Floods Years	Total Average Annual Flood Damages, $/Year (1)
1A	581.6	33,000(2)	30	50,500(3)	33,000	30	66,400(4)
1B	592.2	15,200	55	1,300	9,000	15	9,500
2A	597.2	11,000	10	400	1,300	2.5	12,400
2B	616.1	7,000	2	1,600	7,000	2	1,700
3A	619.3	15,400	60	100	12,800	35	100
3B	628.3	17,000	125	100	1,700	3.1	96,100
3C	635.0	13,200	25	200	1,800	2.5	9,300
				54,200			195,500

1. Based on October 1973 price levels

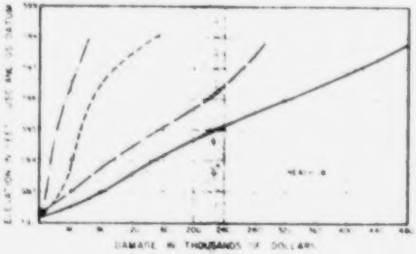
2. Buffalo River at confluence with Cazenovia Creek

3. Although the frequency of flooding along this reach is only once in 30 years, flooding is so widespread that total damages are extensive, as this amount reflects

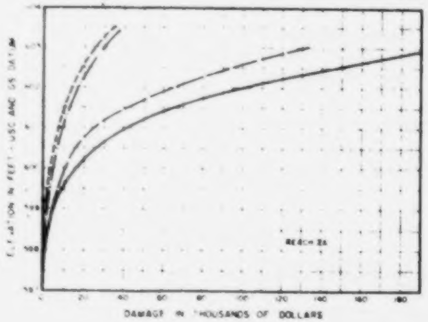
4. Includes $15,900 in annual costs for ice patrols by the City of Buffalo in Subreach 1-A



INDEX POINT ON BUFFALO RIVER IMMEDIATELY DOWNSTREAM FROM MOUTH OF CAZENOVIA CREEK AT BUFFALO RIVER MILE 5.38



INDEX POINT 1B AT 82+00



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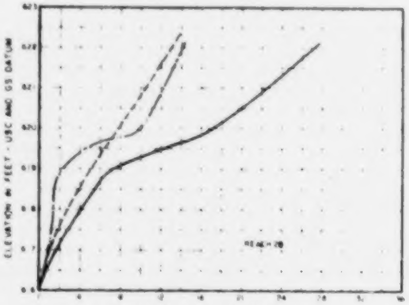

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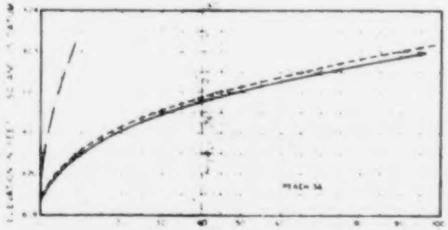
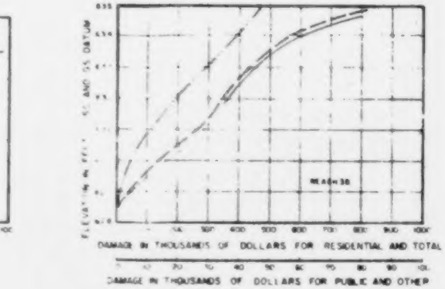
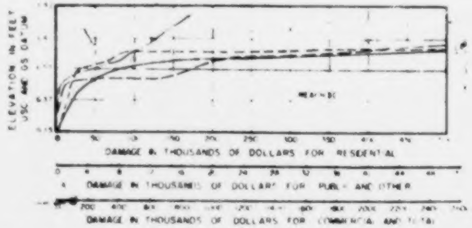


INDEX POINT 3A AT 21?+00



INDEX POINT 3B AT 273+50



INDEX POINT 3C AT 308+00

LEGEND

[illegible] PRICE LEVELS FOR SUBREACHES EXCEPT 3B AND 3C WHICH ARE AT APRIL 1972 PRICE LEVELS.

——— TOTAL

— — RESIDENTIAL

- - - COMMERCIAL

— - — PUBLIC AND OTHER

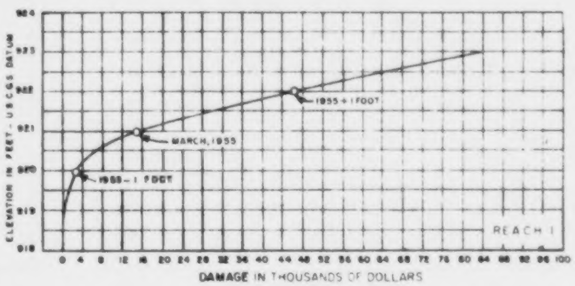
STATIONAGE MEASURED UPSTREAM FROM MOUTH OF CAZENOVIA CREEK EXCEPT [illegible]

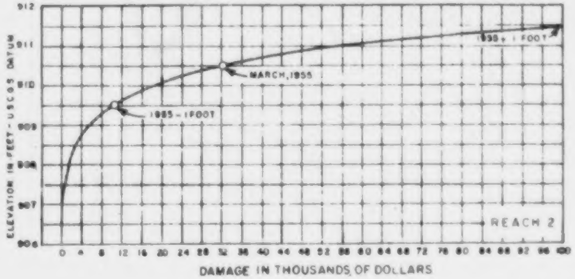
CAZENOVIA CREEK NEW YORK

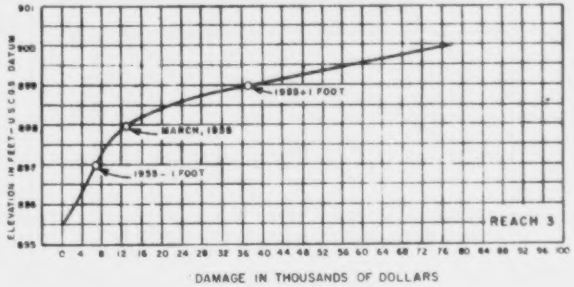
STAGE-DAMAGE CURVES
FOR CAZENOVIA CREEK
U.S. ARMY ENGINEER DISTRICT, BUFFALO

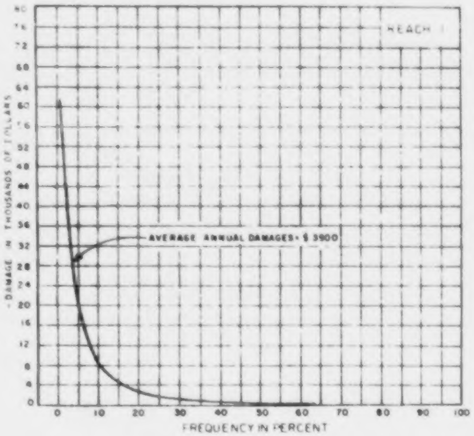
[redacted]

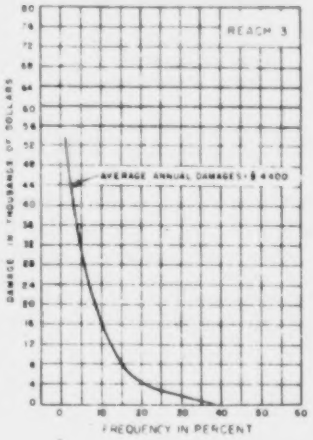
PLATE 27

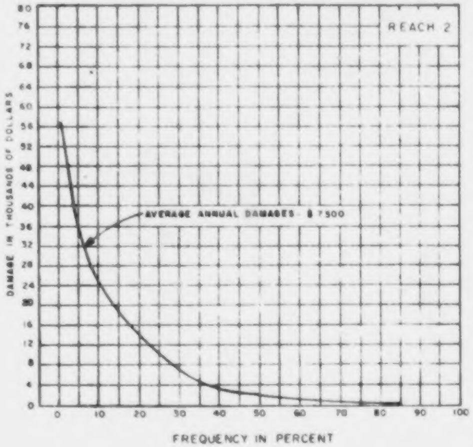












NOTES

INDEX POINT LOCATIONS

REACH 1 - UPSTREAM SIDE OF PINE STREET BRIDGE
REACH 2 - 500 FEET DOWNSTREAM OF WHALEY STREET BRIDGE
REACH 3 - UPSTREAM SIDE OF MAIN STREET BRIDGE

ALL VALUES SHOWN ARE ON THE JANUARY, 1973 PRICE LEVEL AND CONDITIONS OF DEVELOPMENT AT THE TIME OF THE DECEMBER, 1963 SURVEY

LEGEND

○ 1955 STAGE AND ESTIMATED DAMAGE FROM FLOOD

○ 1955 + 1 FOOT ESTIMATED DAMAGE FOR FLOOD 1 FOOT HIGHER THAN 1955 FLOOD

CAZENOVIA CREEK NEW YORK

STAGE-DAMAGE AND
DAMAGE-FREQUENCY CURVES
FOR TANNERY BROOK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 28

Table 34

Stage- and Frequency-Damage Data For Tannery Brook Under Existing Conditions

Reach Index Point	Elevation at which Flood Damages Begin, ft. above sea level	Corresponding Return Period, years	Average Annual Flood Damages, $/Year*
1	918.8	Approx. 1	3,700
2	907.2	Approx. 1	7,700
3	895.5	2	4,600
			16,000

* Based on October 1973 price levels

2.222 Subreach 2A extends from the New York State Thruway Bridge to Orchard Park Road Bridge. The left floodplain of this reach includes residential development, but the right floodplain is undeveloped. The 100-year flood would affect 132 residential units, with three receiving first-floor flooding; five commercial units, two of which would suffer first-flood flooding; and one public or other unit.

2.223 Subreach 2B extends from Orchard Park Road Bridge to Ridge Road Bridge. This reach includes largely undeveloped floodplains and most flood damage occurs to commercial units and public utilities. The 100-year flood would affect two residential and two commercial units, causing first-floor flooding in all four.

2.224 Subreach 3A extends from Ridge Road Bridge to just downstream of Parkside Drive in West Seneca. In this area the floodplain is largely undeveloped and the 100-year flood would affect only six commercial units causing first-floor flooding in all.

2.225 Subreach 3B extends from just downstream of Parkside Drive to just upstream of Singer Drive. The right floodplain in this area is fully developed for residences, some of which are flooded annually. The 100-year flood would affect 202 residential units. and cause first-floor flooding in 47. A high bluff on the left bank prevents flooding in this area.

2.226 Subreach 3C extends from upstream of Singer Drive to upstream of Mill Road. In this reach a bluff forms the left bank of the channel.

Southgate Shopping Plaza has been constructed between Singer Drive and Union Road in the right floodplain. The right bank has been raised and protected in the same area. However, a flood the size of the 1959 flood would inundate the parking area around the plaza and flood the first floors of all stores. Above Union Road a residential development occupies the right floodplain and units adjacent to the channel are occasionally flooded. In Subreach 3C, the 100-year flood would affect 149 residential units, causing first-floor flooding in 15; and would cause business losses to Southgate Plaza Stores.

2.227 Above Mill Road, Cazenovia Creek flows in a well-defined channel. There are scattered developments in the floodplain up to the village of Spring Brook. Between Spring Brook and East Aurora, the creek flows through a gorge in which there is virtually no development. Between East Aurora (where the East and West Branches join) and the hamlet of Griffin Mill, the West Branch of the creek flows in a deeply incised channel having a steep rock bank on one side and a more gently sloping till alluvium bank on the other. No significant flood damage has been reported in this area. Upstream of Griffin Mills the channel is not so deeply incised and development has occurred along the banks, especially above Colden. Flooding along this stretch of the creek was reported in September 1967 and residential and commercial properties adjacent to the creek suffered flood damages. Other damages include highway washouts and downed power lines. This flood affected one public, one commercial, and 10 residential units in West Falls; six residential, one public and three commercial units in Colden; and two residential units in Glenwood. The East Branch flows through a valley and most development is high enough to avoid flooding, with only isolated residences close enough to the creek to be flood prone. Although a County highway bridge in the Town of Holland was damaged during the September 1967 flood, recent floods have caused no repeated damages to private property along this stretch.

2.228 Future Flood Damages

2.229 Due to recent and pending Federal, State, and local legislation directed at controlling future use and development of floodprone areas, flood damages were not projected to increase due to future encroachments on the floodplain. On the contrary, control of future floodplain development could result in an eventual decrease in physical flood damages as existing residential and commercial properties become obsolete and are replaced by developments that are floodproofed or associated with uses compatible with a floodprone location.

2.230 This possible decrease in physical damages might be offset, however, by improvements to existing developments. For instance, as residents experience continued growth in income, a part of this growth will be invested in home improvements involving the structure, the contents, or both. Similarly, industrial and commercial establishments wishing to increase production or sales will expand their facilities and invest in additional equipment.

SECTION 3

3. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.01 The Buffalo District Corps of Engineers requested eight public planning agencies, which have particular interest in the West Seneca area, to evaluate the relationship of the proposed flood control improvements on Cazenovia Creek to their respective land use plans for the project area. The planning agencies were requested to analyze potential areas of compatibility or conflict between the proposed project and the objectives and specific terms of existing or proposed land use plans, policies, and controls, if any, that may have been formulated for the project area. Types of plans considered included master plans, zoning regulations, plans developed in response to the Clean Air Act and Federal Water Pollution Act Amendments of 1972, and other related land use proposals.

3.02 Agency Proposed Project Reviews

3.03 The New York State Parks and Recreation office noted that an area on Cazenovia Creek, just upstream of the proposed project, has been considered for acquisition and development of a State park. Since the potential State Park Acquisition Area is upstream of the proposed ice retention structure, the Corps is proceeding with its plan for flood control on Cazenovia Creek. The Parks and Recreation office also asked the Corps to consider the feasibility of a continuous trail system, which would utilize any levees and banks along Cazenovia Creek in the improvement proposal. Every consideration would be made in design of the flood control project to permit public use for a trail system.

3.04 The following land use planning agencies were contacted but did not reply to the Corps' request:

State Office of Planning Services
Erie-Niagara Regional Planning Board
U. S. Department of Housing and Urban Development
Erie County Department of Planning
West Seneca Town Planning Board
West Seneca Town Zoning Board
Office of Planning and Development

SECTION 4

4. THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

4.01 Summary of Proposed Plan

4.02 The proposed plan recommends floodplain management and participation in flood insurance programs as means of controlling floodplain encroachment and lessening the potential impact of future flooding. To alleviate flood damages to existing development in West Seneca, an ice retention structure upstream of Reach 3 is proposed. No other structural measures are recommended for any other damage reach in the Cazenovia basin.

4.03 Transient Impact

4.04 Included here are all construction-related disturbances which will cease upon completion of the project. Construction activities will be planned to minimize the impact on existing vegetation and wildlife. The specifications for the project contract will contain provisions for environmental safeguards, including proper layout and construction of project plant facilities; landscape preservation; controls of air, water, and noise pollution; and other factors necessary to minimize degradation of the project site and to require restoration of contractor caused environmental damage as feasible. Measures to control soil erosion will be undertaken. These will include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measures, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation. Air and water pollution restrictions will be based upon guidelines for the specific project area obtained from the regional offices of the Environmental Protection Agency and the responsible state agencies, prior to preparation of the specifications.

4.05 Despite these precautions, construction on stream banks and channels will involve certain unavoidable impacts. Turbidity will be increased, temporarily driving away fish and other organisms and possibly causing other damage of a more lasting nature (see Section 4.06). Certain residents invariably will be annoyed and inconvenienced by the usual disturbances attending heavy construction. Noisy earthmoving equipment will kick up dust and mud, and emit exhaust fumes and smoke. However, because of the rather isolated location of the proposed structural works, few individuals will actually experience such annoyances.

4.06 Lasting Impact

4.07 This section discusses those effects which can be expected to last for at least, and in some cases beyond, the approximate 100-year useful life of the project.

4.08 Lasting Environmental Impact

4.09 The proposed plan provides for the construction of a concrete ice retention dam spanning Cazenovia Creek approximately 1,000 feet east of the Main Street-Seneca Street intersection in West Seneca. This structure (see Plate 4) would extend some 900 feet in length, with a base width of 20 feet. The heights of the lower and upper weirs would be respectively 10 and 18 feet above the channel bottom with wingwalls extending another 13 feet above the upper weir, tying into the valley slopes on either side of the creek. A 5-acre ice area would be excavated immediately behind the dam for the stilling pool. When the stilling pool is formed, backwater effects would extend over another 6 acres of natural creek channel. When these gates are opened, normal summertime flows would pass through the structure without any noticeable backwater effect.

4.10 The ice retention structure is likely to have a mixed effect upon streamlife and water quality in Cazenovia Creek. Increased siltation due to construction may smother sessile or slow-moving organisms downstream, and in addition disrupt spawning beds. This process would lower productivity downstream. Should local interests decide to maintain a permanent pool, increased depth may increase productivity locally upstream. At present, creek productivity is thought to be limited by extreme shallowness--nutrient levels are thought sufficient to support algal blooms in the main stream (see Section 2). Increased productivity and depth in such a permanent pool might support sizable populations of small game or panfish, such as sunfish, perch, or even bass. However, if the pool is drained as planned, productivity may not increase as greatly and may be unaffected.

4.11 The proposed plan will involve draining the stilling pool for the late summer, fall and early winter months. The drain culverts would be low level structures with inverts near the creek thalweg. If a permanent pool were to be provided, its lower waters might stagnate; such water could be drained by opening the drain culvert gates. The pool may stagnate only under relatively extreme conditions: a combination of flourishing algal and consumer populations coinciding with an extended period of hot, dry, calm weather. Although such a pool would be somewhat sheltered by its location, prevalent climatic conditions (especially wind) favor a degree of mixing adequate to forestall stagnation. Nevertheless, it is recommended that either drainage of the pool be restricted to cooler windy periods or no pool be allowed to form when conditions favorable to stagnation occur.

4.12 Floodplain management provisions of the project are of potential benefit to the aquatic ecosystem of Cazenovia Creek. By controlling basin growth and floodplain encroachment, floodplain management serves to perpetuate the natural state of the creek and primary floodway and eliminate the necessity of environmentally costly structural measures for flood protection at a later date.

4.13 Approximately 15 acres of lowlying scrubland would be cleared during construction of the ice retention structure, including 5 acres for the proposed stilling pool. Ice scour could damage trees and shrubs on approximately an additional 50 acres. Beyond the 5 acres excavated behind behind the dam, the creek would be confined to its channel, although its depth would be increased. The land inundated harbors a variety of small bird, amphibian, reptile, and mammal species. Common among these are various songbirds, pheasant, leopard frogs, spotted newts, cottontail rabbit, skunk, opossum, and numerous small rodents. Displaced vegetation includes trees such as black willow, eastern cottonwood, and boxelders and shrubs such as mulberry, wild grape, and staghorn sumac. It is expected that displaced animals will migrate into adjacent scrubland areas during the construction phase.

4.14 Floodplain management provisions of the proposed project would help perpetuate the natural state of the floodway. Furthermore, recreational development compatible with the tenets of floodplain management would preserve productive or otherwise valuable stretches of creek frontage. Approximately 40 square miles of land near the creek would be so effected.

4.15 Lasting Socioeconomic Impact

4.16 It is anticipated that no existing industrial or commercial activity and public service would be disrupted. No homes or farmsteads would require relocation. Only one man-made structure - an abandoned warehouse - would be relocated. Inundation rights would have to be obtained for about 20 acres of potential agricultural land; there would be no significant loss of tax revenues.

4.17 The proposed structural flood control measure would reduce the potential threat of flooding and its consequences in reaches 1 through 3. These include traffic and emergency service disruptions, physical injury and property damage, threats to public health and safety due to flood-borne infectious agents and vermin, disruption of commercial activity, and lowered property values in flood prone areas. See Section 4.27 for a detailed description of flood damage reduction benefits. Floodplain management would reduce the damage potential of future floods.

4.18 The vicinity of the ice retention structure could be incorporated into a larger parkland-recreational complex, perhaps including Mill Road Park. Should local interests decide to maintain a permanent pool, this reach of Cazenovia Creek might prove attractive for boating, canoeing, and/or fishing.

4.19 Floodplain management programs, if prudently implemented, should consider conversion of high-risk flood areas into open park lands, or at least check the spread of suburban development in these areas until such time as their recreational value can be ascertained.

4.20 Aesthetic Impact

4.21 The ice retention structure would alter the existing environmental setting in the project area, giving it a man made appearance. However, to help mitigate the aesthetic impact, the construction site would be restored by grading and mulching of slopes and reuse of stripped topsoil, to establish proper grasses and other vegetation adaptable to soil and climatic conditions in the area.

4.22 Archaeological Impact

4.23 Archaeological sites are known in West Seneca, and it is possible that one or more of these may occur at the structure's dam site above Reach 3. In this case, disruption or destruction of such sites might occur. Based upon the results and recommendations of a preconstruction field survey by professional archaeologists, the need for salvage or preservation of any significant archaeological sites will be determined.

4.24 Impact on Flooding

4.25 The primary benefits of the recommended ice retaining structure would be the reduction in average annual damages along Cazenovia Creek from $228,700 to $75,300. These values are based on October 1972 level of development and October 1974 price levels. See Plate 2 for location of damage reaches.

4.26 The above reduction in flood damages would be the result of lowering the floodwater levels in those reaches where ice jamming usually occurs. On Plate 21 the ice-affected stages and the free flow (no ice present) stages are shown. The effect of removal of the ice by the ice retaining structure can best be noted in Subreach 3B. For example, in Subreach 3B with ice present there is a 1 percent chance each year that the water level would reach 633.3 feet; whereas, if the ice retaining structure were provided, the level would only be 628.2 feet.

4.27 Damage Reduction By Reach

4.28 There would be very little flood damage reduction in Subreach 1A because the ice stages and free flow stages are the same. Most flooding damage in this reach is due to basement flooding and has resulted from a combination of overland flow and storm sewer backup. High water stages in Cazenovia Creek in this area are usually a result of backwater effects from Buffalo Creek, not ice jamming on Cazenovia Creek. However, the need for the City of Buffalo to continue ice breaking activities in this reach could be eliminated by construction of the ice retention structure.

4.29 In Subreach 1B, the 1 percent flood stages are reduced 3 feet by the ice retention structure.

4.30 In Subreach 2A, the water level that has a 1 percent chance of occurring each year would be reduced by 3 feet following construction of the recommended ice retention structure or the chance of flood damage occurring each year has been reduced from 40 percent to approximately ten percent.

4.31 Subreach 2B consists largely of low, undeveloped floodplain. Most damage occurs to commercial units and public utilities. The ice retention structure would not significantly decrease the flood levels and average annual damages in this reach.

4.32 Subreach 3A is similar to Subreach 2B, i.e., low largely undeveloped land. The average annual damages in this area are less than $100 under existing conditions. The ice retention structure would reduce flood levels somewhat in this reach.

4.33 In Subreach 3B, as noted earlier, the ice retention structure would reduce the flood stages over 5 feet for a 1 percent probability flood. This large reduction in flood stages reduces the average annual damages from in excess of $104,000 to approximately $100 based on October 1974 prices and mid-1972 level of development. The chance of a damaging flood level occurring each year has been reduced from greater than 30 percent to less than 1 percent.

4.34 Substantial benefits also occur in Subreach 3C where the Southgate Plaza is located. The chance of water level reaching the Plaza parking area or the houses upstream of Union Road would be reduced from 40 percent to 4 percent on an annual basis. The accompanying reduction in average annual damages is approximately $10,000.

4.35 The degree of protection provided by the ice retention structure and the remaining average annual damages are shown on Table 35.

Table 35

Damage Reduction and Levels of Protection Provided By Ice Retention Structure

Subreach Index Point	Existing Damages $/Year	Residual Damages with Ice Retention Structure $/Year	Existing Average Return Period Between Damaging Floods, Years	Average Return Period Between Damaging Floods, Years
1A	66,400	66,400	30	30
1B	9,500	1,300	15	55
2A	12,400	400	2.5	10
2B	1,700	1,600	2	2
3A	100	100	35	60
3B	96,100	100	3	125
3C	9,300	200	2.5	25

SECTION 5

5. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.01 Construction Effects

5.02 Regardless of the degree of caution and restraint exercised by the contractor, construction activity will cause environmental disturbances. In the summer there will be dust; in the winter there will be mud. Noise and exhaust fumes from use of heavy equipment will occur throughout the duration of project construction.

5.03 Vegetation and Habitat

5.04 Approximately 36 acres would be disrupted by construction activity or periodic flooding - this would include: 1 acre for the dam site; 5 acres excavated for the stilling pool; 20 acres subject to periodic flooding; 10 acres cleared, grubbed and restored by grading and planting.

5.05 It is estimated that about 65 acres would be subject to potential ice scour above the dam. This would include the aforementioned 5 acres excavated for the stilling pool; 10 acres cleared, grubbed and restored by grading and planting, and an additional area about 50 acres in size east of the dam.

5.06 Effect on Water Quality

5.07 Should local interests decide to maintain a permanent pool, an increase in algal biomass might occur. During the summer, such conditions could cause fouling of the pool and downstream reaches.

5.08 Archeological Impact

5.09 The Buffalo District, Corps of Engineers conducted a cultural resource reconnaissance study of the proposed Cazenovia Creek project area, including the proposed ice retention structure site and stilling pool area, in September 1975. The study, which included literature research and a field reconnaissance, was under the direction of a Corps archaeologist working in cooperation with the New York Archaeological Council.

5.10 An examination of records and maps on file at the State University of New York at Buffalo, and at the office of the New York State Archaeologist in Albany, indicated that there are no known prehistoric cultural resources in the proposed project area.

5.11 Ms. Kathy Miller, an archaeologist associated with the State University of New York at Buffalo, was the study's principal investigator during the 24-25 September 1975 field reconnaissance of the project area. As a result of the field work, two sites in the proposed project area were located and inventoried. One site was designated as a possible aboriginal site because of the discovery of a core module of indigenous flint and a scatter of associated flakes. A second site was described as a possible historic site in the form of a small structure of unknown age with an association of concentrated non-indigenous fruit trees. These features may mark the location of possible former historic sites associated with the occupation of the Buffalo Creek Indian Reservation by the Iroquois during the late eighteenth and early nineteenth centuries.

5.12 Upon Congressional authorization for advanced engineering and design work on the proposed project, a survey level cultural resources study of the proposed project area and area of potential environmental impact will be conducted as recommended by the principal investigator. The survey study will be conducted according to a scope of work based on the principal investigator's recommendations, a preliminary ethnohistoric report submitted to the Buffalo District by Dr. Marian White (1974), and an ethnohistorical and archaeological proposal for additional study by Thomas King (1975). This scope of work will include guidelines for an ethnographic study of the immediate proposed project area (ice retention structure and stilling pool) and the downstream area of potential environmental impact that would be protected by the proposed project. The scope of work will also specify the cultural resource survey's research guidelines for site evaluations and application of the National Register criteria as publised in the 25 January 1974 Federal Register (39 FR 3366), and codified in the proposed Corps regulation that appeared in the 8 September 1975 Federal Register (33 CFR, Part 305). The survey's results will be used to formulate a cultural resource mitigation plan, which could include realignment of project features to preserve any significant resources that may be present.

5.13 Historic Resources

5.14 Correspondence from the New York State Office of Parks and Recreation, Division of Historic Preservation, dated 10 March 1975, indicated that "the birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Historic Register of Historic Places." This historic landmark is located in East Aurora, NY, about 7 miles southeast of the proposed ice retention structure site.

SECTION 6

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 Development of Flood Control Alternatives

6.02 Table 36 depicts the method used to formulate viable alternative flood control plans from which the recommended plan of action was chosen. Considered flood control measures are discussed below. See Appendix D for pertinent economic data.

6.03 Floodproofing

6.04 Floodproofing measures were found to be economically viable in Reach 3 and hence eligible for inclusion in an alternative plan. Elsewhere in the basin, floodproofing was found to be economically unjustifiable.

6.05 Local Protection

6.06 Levees were considered for individual reaches of the lower basin. Only one levee, protecting Reach 3 was found to be economically viable.

6.07 Channelization

6.08 Channelization was found to be economically and environmentally unjustifiable as a primary flood control measure.

6.09 Floodplain Management and Flood Insurance

6.10 Floodplain management and participation in flood insurance programs are considered to be desirable adjuncts to any flood control program and are therefore highly recommended.

6.11 Diversion Channels

6.12 Diversion of floodwaters from Cazenovia Creek to Smokes Creek was rejected due to the insufficient capacity of Smokes Creek. Diversion of floodwaters from Tannery Brook to a tributary of Buffalo Creek was rejected as economically unjustifiable and of possible effect on flooding along Buffalo Creek.

6.13 Culvert Widening

6.14 Culvert widening would only be effective along Tannery Brook. However, such measures were rejected as economically unjustifiable.

Table 36

FLOW CHART FOR DEVELOPMENT OF FLOOD CONTROL PLANS

STEP 1	Identify all plausible individual flood control measures.	Implausible measures are rejected.
STEP 2	Conduct preliminary qualitative screening of measures on basis of engineering practicability, social acceptability, economic feasibility, capability of providing adequate solution to flood problems, etc.	Impracticable, unacceptable, infeasible, and inadequate measures are rejected.
STEP 3	Identify remaining individual measures and/or reasonable combinations of remaining measures that will protect individual damage areas or series of damage areas.	
STEP 4	Determine economic feasibility of identified individual measures and/or combinations of measures.	Infeasible measures and combinations of measures are rejected.

Table 36 (cont'd)

FLOW CHART FOR DEVELOPMENT OF RECOMMENDED PLAN

STEP 5	Develop alternatives for the basin, each alternative consisting of a set of compatible measures and/or combinations of measures that would provide a coordinated basinwide flood control program.	
STEP 6	Analyze each alternative on the basis of national economic development, environmental quality, social well-being, and regional development; best alternative becomes the selected plan.	Less attractive alternatives are rejected.
STEP 7	Develop recommended plan by formulating the selected plan for scale of development.	

6.15 Reservoirs and Impoundments

6.16 A flood control reservoir near Spring Brook was considered to be an effective measure, but was rejected as economically unjustifiable. Small flood retention ponds in West Seneca and East Aurora were rejected as environmentally, aesthetically and economically unsound. An ice retention impoundment reservoir found to be both effective and economically viable.

6.17 No Action by Corps of Engineers

6.18 No action in the Cazenovia Creek Basin was rejected as counterproductive. It is felt that municipal and regionwide floodplain management programs might be delayed or discouraged without Corps support. Such action means that flood damage to floodplain lands and developments and resultant hardship and suffering to community residents would continue. Change of property ownership in the floodplain would continue, but selling of homes may be somewhat more difficult, with a resultant impact on home prices. Safety and health of communities in the floodplain would be jeopardized in the event of continued flooding. Flood damage to private lands and structures could reasonably be expected to continue; as a result, associated temporary adverse impacts such as relocation of affected families and disruption of transportation routes, utilities, commercial activities and employment could be expected. Lack of adequate flood protection would continue to create a feeling of community insecurity due to the potential flooding threat. Environmentally, soil erosion and siltation due to flooding would continue to cause some destruction and disruption of vegetation and wildlife habitat along the creek's banks. In addition, such future floods may even destroy or disrupt existing archaelogical sites in the floodplain, thereby precluding salvage or protection of such sites.

6.19 Alternative Flood Control Plans

6.20 Given 1972 development in the Cazenovia Creek Watershed, October 1973 prices, and the then prevailing amortization interest rate of 5-5/8 percent, four measures were identified as being sound and desirable from engineering, environmental, and economic standpoints: an ice retention structure in West Seneca, local protection in West Seneca, floodproofing structure in West Seneca, and floodplain management throughout the basin. Given current prices and the now prevailing interest rate of 6-7/8 percent, the considered local protection in West Seneca becomes unjustifiable; however, the plan providing for it is described in Alternative 1 for the purpose of comparison. The following alternative plans were formulated:

Local Protection in Reach 3 and Floodplain Management
(Alternative 1)

Floodproofing in Reach 3 and Floodplain Management
(Alternative 2)

Ice Retention Structure and Floodplain Management
(Alternative 3) - The Recommended Plan

No Action
(Alternative 4) - Discussed in paragraph 6.18.

The recommended plan is discussed in Sections 1 and 4. Descriptions and anticipated impacts of the alternative plans 1 and 2 are discussed in the following paragraphs.

6.21 Plan Description for Alternative 1

6.22 A plan of improvements for Alternative 1 is given in Plate 29. A levee parallel to Parkside Drive would be constructed from the high ground along Seneca Street parallel to the rear property line of residents along Parkside Drive and then east parallel to the right creek bank. This levee would continue upstream to join the high ground at the Southgate Shopping Plaza. The creek channel would have to be relocated along West Willowdale Drive near Parkside Drive to provide sufficient room for construction of the levee. Riprap bank protection would be provided as required along this section.

6.23 From the upstream end of the levee a three foot high floodwall would be constructed to Union Road. A sheet pile I-wall section would be used.

6.24 A 36-inch culvert would drain all of the runoff not entering the existing storm sewers from the 102 acre drainage area bounded by the considered levee, Union Road and Seneca Street. The culvert would be provided with a gatewell, sluice gate and flap gate. Ponding areas, behind the levee, would be provided to store runoff that occurs coincident with flood stages in Cazenovia Creek.

6.25 The drainage structure would be able to pass the runoff from a 50-year storm without causing any flood damage during low creek stages. Ponding area storage was used to modify the peak flow from the storm. In the event of high creek stages coincident with storm runoff, the ponding areas would contain the runoff from a 100-year, 6-hour storm, about 2.5 inches of runoff from the respective drainage areas. A runoff coefficient of 0.7 was used in all computations.

6.26 The existing storm sewers which cross the considered levee alignment would be provided with gatewells, each with a flap gate and a sluice gate. Aproximately 280 feet of 24-inch sanitary sewer, between stations 279+100 and 282+00, would require relocation to avoid crossing or running under the levee alignment by the Southgate Shopping Plaza. In addition, approximately 100 feet of the 18-inch sanitary siphon would be lowered under the relocated channel. Along with the sewer relocations, one manhole on the 18-inch siphon would have to be relocated. Thirty-four sanitary sewer manholes would have to be waterproofed to prevent water from entering and causing a backup.

6.27 After the relocations, the sanitary sewers would cross the levee alignment at two locations. At the point where the 18-inch sewers cross the alignment, a gatewell with a sluice gate and an automatic shear gate would be provided. At the point where the 36-inch sewer crosses the levee alignment, a gatewell with a sluice gate and a flap gate would be provided. In the event of a rupture in the 18-inch sewer line leading into the protected area, the automatic shear gates would be needed so that they could be reopened after repair had been affected. If a break should occur in the sewer line which removes the sewage from the protected area, the flap gate, which would reopen of its own accord after repairs, would suffice.

6.28 Floodplain management provisions are identical to those of the proposed project. See Section 1.

6.29 Environmental Impact of Alternative 1

6.30 Alternative 1 would require the construction of 3,500 ft. of levee (top width 10 ft., base widths and height in some sections approaches 60 ft. and 10 ft. respectively) from Seneca Street parallel to the rear property lines of those residents living along Parkside Drive, and then east to join the creek bank; then a continuation of the levee along the north creek bank up to the Southgate Shopping Plaza. Along this stretch of the creek structural measures would also include approximately 1,400 ft. of channelization, 4,250 ft. of riprapping and 800 ft. of floodwall construction.

6.31 As in the proposed plan, construction would be attended by noise, exhaust fumes, and dust and mud. The existing ecology of the creek channel in the channelized construction zone will be disrupted. Although the stream here is extremely shallow and flows over exposed rock, construction activity in the creek bed will cause fish to temporarily move out of the aquatic area being disturbed. Also, disturbance of the streambed and adjacent banks by channelization will create temporary turbidity by increasing the amount of suspended solids in the creek. Such an effect might smother slow-moving or sessile benthic organisms.

6.32 Alternative 1 would require the disruption of 5 acres of land in the considered design path. Approximately 1 acre of this land supports large trees, chiefly black willow and eastern cottonwood. The average diameter of the larger trees is estimated to be 24 inches, with some up to 50 inches in diameter and over 100 ft. in height. These trees harbor many species of smaller birds and mammals. It is also possible that use of land behind the levees as temporary ponding areas would disrupt or alter its ecology, depending upon the size of the area inundated and the duration of submergence.

6.33 Aesthetically, the levee and floodwalls would intrude upon the natural creekside setting. The angular levee would block the residents' view of the creek. Loss of trees might be balanced by a careful program of landscaping, seeding and planting.

6.34 The socioeconomic impact of Alternative 1 would be quite similar to that of the proposed plan. Existing development in Subreach 3B would be protected against the 100-year flood. Flood stages upstream or downstream of the protective works would be unaffected. Floodplain management would promote prudent land use in Cazenovia Creek Basin, preserving areas of possible recreational value and reducing the potential for future flood damage.

6.35 Alternative 1 might involve the loss of Indian artifacts. As in the proposed plan, an archeological survey would be taken of the area to locate such artifacts, determine their worth, and salvage whatever is deemed valuable.

6.36 Plan Description for Alternative 2

6.37 Alternative 2 involves floodproofing in Subreach 3B. Floodproofing consists of modifications to structures to reduce flood damages. These modifications can be undertaken in existing buildings, or incorporated into new buildings at locations where studies have indicated that the new construction is a proper use of a floodplain. As floodproofing measures apply to specific structures and are often undertaken in existing buildings, they are generally the responsibility of an individual or organization. A floodproofing program would normally warrant consideration under the following circumstances:

a. Where construction of flood-control structures is not economically feasible or cause overriding adverse impacts;

b. Where effective functioning of an enterprise requires waterfront location;

c. Where flood insurance is allied to floodproofing;

d. Where floodproofing can complement flood-control projects.

6.38 There are many types of floodproofing measures which can be implemented depending on the circumstances encountered and the degree of protection desired. In general, floodproofing measures should:

a. Prevent water entering the building through underground sewer pipes. This is usually done by inserting backflow check valves in the main sewer line leading into a structure.

b. Prevent water entering the building from grade level. This is usually done by inserting watertight fittings in openings such as basement windows, constructing small levees around the property, or raising the elevation of low areas around the building.

c. Construct all new buildings with first floor levels above flood level or raise existing buildings above flood level.

6.39 Floodplain management provisions of Alternative 2 would be identical to those of the proposed plan and Alternative 1.

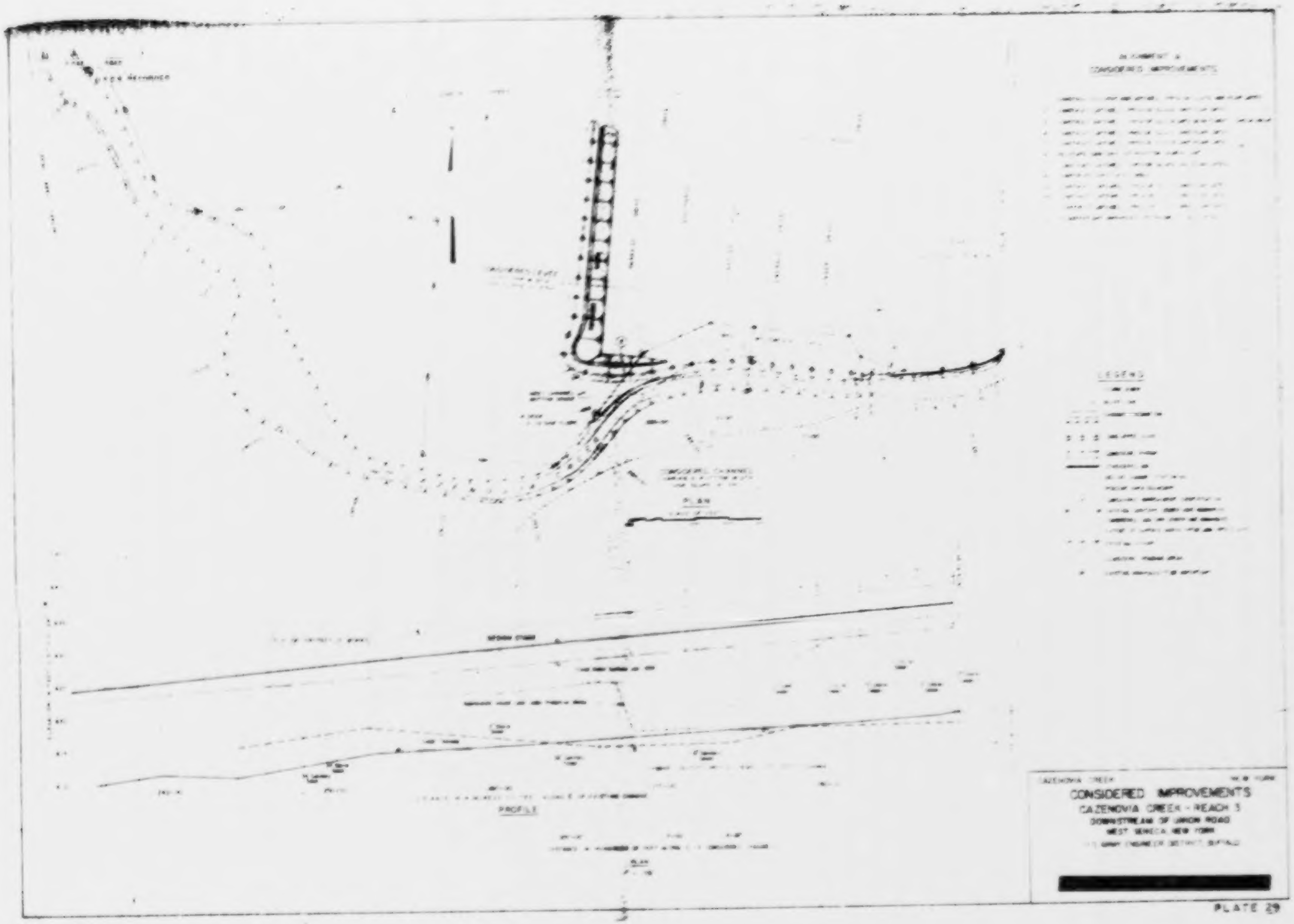
6.40 Impact of Alternative 2

6.41 Floodproofing would have no ecological impact on the creek basin. Furthermore, floodproofing would not alleviate or reduce many flood hazards--streets would be flooded, traffic delayed, etc. From an economic standpoint, floodproofing would constitute an unwelcome financial burden to residents of floodprone areas. Even with Federal cost-sharing, residents would have to pay $200-$1,000 for such measures. Furthermore, aesthetic tradeoffs might well be necessary to achieve a desirable level of flood protection.

6.42 Floodplain management would have the same beneficial impact here as in the proposed plan and Alternative 1.

6.43 Cost Effectiveness and Alternative Plan

6.44 Alternative 1 was rejected bacause it becomes unjustifiable in light of current prices and the prevailing interest rate. Alternative 2 was rejected because it also offers a lower benefit/cost ratio (1.39 versus 2.06, given 1972 development, October 1973 prices, and an interest rate of 5-5/8 percent), and lower net benefits ($25,700 versus $72,700) and is furthermore strongly opposed by residents of Subreach 3B in West Seneca. See Appendix D for detailed cost data.


ALIGNMENT A
CONSIDERED IMPROVEMENTS
LEGEND
CONSIDERED LEVEE
CONSIDERED CHANNEL
PLAN
PROFILE

CAZENOVIA CREEK NEW YORK

CONSIDERED IMPROVEMENTS

CAZENOVIA CREEK - REACH 3

DOWNSTREAM OF UNION ROAD

WEST SENECA, NEW YORK

U.S. ARMY ENGINEER DISTRICT, BUFFALO

[redacted]

PLATE 29

SECTION 7

7. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Flood management, the chief objective of the proposed project, would be attained. Flood damages would be lessened, land values would be enhanced, and the threat of loss of life and property would be lessened. A major psychological benefit to residents in the floodplain would be the feeling that flood management was accomplished. Residential units, commercial firms and essential services would be protected to varying degrees in the floodplain in West Seneca. In the long run, the proposed flood control and floodplain management measures would help reduce damage and cleanup costs to community residents, and help perpetuate the natural state of the floodway. Recreational values could increase.

7.02 Conversely, the proposed project would disrupt existing natural terrestrial and aquatic habitats along Cazenovia Creek between Mill and Leydecker Roads in West Seneca. Clearing and construction would alter the landscape. Many large trees together with associated groundcover species would be destroyed or rendered vulnerable to ice scour, and excavated soils would be displaced. Aquatic organisms and wildlife would be destroyed or driven from the area.

SECTION 8

8. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

8.01 Implementation of the proposed plan would involve the following:

a. Disruption of 15 acres of wooded scrubland, five of which would be inundated by a stilling pool, in late winter and early spring.

b. Possible destruction by siltation of approximately 1,000 feet of stream bottom habitat (immediately upstream of the dam of the ice retention structure).

c. Commitment of labor, time, money, and materials to construct the project.

d. Loss of existing natural appearance in the project area due to manmade features.

SECTION 9

9. COORDINATION

9.01 A feature of the Cazenovia Creek Study Effort has been the input of the public in the process of plan formulation. In the context of this Environmental Impact Statement, the public is defined as those with interest in the review, be they individuals, agencies, organizations, institutions, or the like. Not only has the public been encouraged to participate in plan formulation, but the Buffalo District has actively sought the informed opinion of certain groups with special interest in the project. These efforts are documented in this section.

9.02 Public Participation

9.03 A public meeting was held on 11 December 1959 to ascertain the needs and opinions of residents affected by the disastrous flood of 21 January 1959. The following items are exerpted from this meeting:

a. A member of the New York State Assembly felt that "The situation, especially in South Buffalo, is one that should be looked at carefully because the level of the creek bottom there is not much lower than the streets." He asked, "that a careful survey be made."

b. The County Supervisor, Third Ward, felt that "Immediate corrective steps should be taken so as to prevent a recurring of what happened (on 21 January 1959)."

c. The Supervisor, Town of West Seneca, presented a petition, from property owners on West Willowdale Drive, which outlined their opinion "that minimum corrective action taken should include: snagging and clearing debris, channel deepening, straightening and elimination of severe curves, contouring banks, and arranging a coordinated warning system."

d. The County Supervisor, Second Ward, presented a petition originated by the Cazenovia Creek Improvement Committee and signed by 5,300 persons within the immediate area of Cazenovia Creek, particularly in the south side of Buffalo. They requested that immediate action be taken "to prevent a repetition of the disastrous flood conditions which occurred on 21 January 1959."

e. The Mayor of East Aurora appealed "for whatever can be offered in the way of assistance to diverting the inherited water (from upstream on Tannery Brook) so that we can take care of our own (within the village limits)." The statement indicated that a Soil Conservation Service proposal and study about 1956 "recommended construction of a shallow diversionary floodway connecting that portion of the Tannery Brook basin lying east of the corporate limits with a study in 1967 and determined that a project could be justified but local interests did not favor construction.

f. The Cazenovia Creek Improvement Committee provided specific recommendations for improvement consisting of four main parts, providing for a small reservoir in Cazenovia Park and channel straightening upstream.

g. A representative property owner from the Wichita Road area indicated that they were "very much in favor of something being done to help so we will not suffer the inconvenience and loss we have had previously."

h. The United States Soil Conservation Service recommended that: the willow trees lining the channel along Legion Drive between Cazenovia Street and the mouth of Cazenovia Creek be trimmed extensively; snags and trees along the bank of Cazenovia Creek through the park be removed to reduce obstruction to flow; clearing and snagging be done between the park and Orchard Park Road; a dike be constructed around the perimeter of Cazenovia Park; and the retention of ice be increased in one or more areas between Orchard Park Road and Leydecker Road in the Town of West Seneca.

9.04 A public meeting was held by the State of New York, Department of Environmental Conservation on 29 June 1971 to obtain the view of local interests on various plans and alternatives for water resource development. Some of the structural plans and alternatives presented in the plan included multi-purpose reservoirs, upland reservoirs, and channel improvement. On 28 October 1971, the State prepared a brief report based upon the opinions expressed at the public meeting. They concluded that no significant opposition was directed to the plans presented in the report except to some of the multi-purpose reservoir proposals including the one proposed at Spring Brook.

9.05 On 28 August 1973 the Southgate Homeowners' Association of West Seneca held a meeting to discuss possible flood control alternatives. Members expressed an earnest desire to alleviate damages and a willingness to embrace any viable structural measures. In addition several informal meetings and one formal public meeting (11 December 1973) were held during the progress of this study. At each of these meetings, one of the major viewpoints expressed, particularly by the members of the Southgate Homeowners' Association, was that floodproofing by individual homeowners was considered an unacceptable alternative. Generally, it was stated that the disruption of normal services and traffic flow during high water as well as the aftermath cleanup were an undesirable aspect of the floodproofing alternative.

9.06 On 26 November 1974 a public meeting on Cazenovia Creek was held at the Allendale Junior High School to discuss the feasibility of an ice retention structure to protect areas of the Town of West Seneca and the City of Buffalo along the Creek. Comments on the recommended plan were solicited for consideration from various Federal, State and local agencies as well as individuals.

9.07 Other

9.08 In order to fully assess the environmental impacts associated with the proposed project on Cazenovia Creek, the Town of West Seneca Erie County, New York, the U. S. Department of the Interior and the New York State Office of Parks and Recreation were requested to examine the proposed project and determine impacts of project activities upon cultural resources located within or adjacent to the project locale. The Department of the Interior indicated that the project would have no adverse effect upon any existing, proposed or known potential units of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs. It was recommended that the Corps maintain contact with the State Historic Preservation Officer and the Department of Interior's Regional Office regarding archaeological matters during the course of the project work. Coordination with both of these entities will be maintained by the Corps. The New York State Parks and Recreation Department pointed out that an area just upstream of the proposed project has been considered for acquisition and development of a State park. The Department asked that the Corps also consider the probability of a continuous trail system along the banks of the creek. Such a trail system would be considered as to its feasibility during the advanced engineering and design phase of project planning. Letters requesting comments from the above mentioned agencies, as well as agency replies, are included in Appendix B, Letters of Coordination.

9.09 Federal agencies providing advice and input to the study included: U. S. Soil Conservation Service, Forest Service, U. S. Fish and Wildlife Service, Bureau of Outdoor Recreation, Environmental Protection Agency, and the U. S. Department of the Interior. State agencies with which a close liaison was maintained were: State Department of Environmental Conservation, Erie and Niagara Counties Regional Planning Board, Erie and Niagara Basin Regional Water Resources Planning Board, and the State Bureau of Fisheries. Frequent contact was also maintained with the following County and town bureaus: Erie County, City of Buffalo, Town of West Seneca, Village of East Aurora, Town of Elma and the Town of Aurora.

9.10 The Corps letter dated 26 April 1977 responded to project concerns expressed by the Erie and Niagara Counties Regional Planning Board in their letter to the Board of Engineers Rivers and Harbors dated 22 May 1975. See pages B-12 through B-15 in the "Letters of Coordination" section of this Final Environmental Statement. In addition, the District Engineer and a member of his staff met with representatives of the Erie and Niagara Counties Regional Planning Board and their Utilities Committee on 18 May 1977. At this meeting, it was reiterated by the Board that they were in favor of the ice retention project, but they also wanted additional structural measures, particularly on Tannery Brook in East Aurora. It was explained again by the District Engineer, that local protection measures for these areas were investigated, but in the final analysis, the measures were found to be economically unfeasible as independant projects. It was further explained that Corps regulations do not allow the add up of costs and benefits for measures along several separated reaches to arrive at a cost effective project. The measures for each area must be incrementally justified on their own merit. The Board and Utilities Committee still retain their position, as they still desire additional flood management measures, particularly for Tannery Brook.

9.11 The draft Environmental Statement was sent to the following agencies for review and comment:

Agency	Date of Request	Date of Comment
U. S. Department of Housing and Urban Development ATTN: Environmental Clearance Officer 26 Federal Plaza New York, NY 10007	27 Nov. 74	No Comment Received
U. S. Department of Agriculture Soil Conservation Service Midtown Plaza, Room 400 700 East Water Street Syracuse, NY 13210	27 Nov. 74	6 Jan. 75
U. S. Department of Transportation Federal Highway Administration 4 Normanskill Boulevard Delmar, NY 12054	27 Nov. 74	10 Dec. 74
U. S. Department of the Interior ATTN: Office of Environmental Project Review Washington, DC 20240	27 Nov. 74	13 Jan. 75, 16 Jan. 75 7 Mar. 75, 9 Jan. 75
Environmental Proection Agency, Region II 26 Federal Plaza, Room 847 New York, NY 10007	27 Nov. 74	27 Jan. 75
Ninth Coast Guard District 1240 East Ninth Street Cleveland, OH 44199	27 Nov. 74	No Comment Received
U. S. Department of Commerce Secretary for Environmental Affairs Washington, DC 20230	27 Nov. 74	No Comment Received
Public Health Service, Region II U. S. Department of Health, Education and Welfare Federal Building 26 Federal Plaza New York, NY 10007	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
Great Lakes Basin Commission P.O. Box 999 Ann Arbor, MI 48107	27 Nov. 74	No Comment Received
New York State Office of Planning Services 488 Broadway Albany, NY 12207	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Division of Historical Preservation Core 1 South Swan Street Building South Mall Albany, NY 12223	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Bureau of Recreation Planning South Mall Albany, NY 12223	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Commissioner 303 South Swan Street Building Albany, NY 12223	27 Nov. 74	10 Mar. 75
New York State Department of Commerce 99 Washington Avenue Albany, NY 12210	27 Nov. 74	No Comments Received
Office of Planning and Development New York State Department of Transportation Administrative and Engineering Building State Campus Albany, NY 12226	27 Nov. 74	No Comments Received
Program Development Division New York State Urban Development Corporation 41 State Street Albany, NY 12207	27 Nov. 74	No Comments Received

Agency	Date of Request	Date of Comment
Office of Environmental Analysis New York State Department of Environmental Conservation 50 Wolf Road Albany, NY 12205	27 Nov. 74	20 Feb. 75
Program Planning and Analysis New York State Department of Health 84 Holland Avenue - Room 250 Albany, NY 12208	27 Nov. 74	9 Dec. 74
The University of the State of New York The State Education Department Albany, NY 12224	27 Nov. 74	18 Feb. 75
New York Archaeological Council 4242 Ridge Lea Road Buffalo, NY 14226	27 Nov. 74	6 Feb. 75
Erie County Department of Planning 95 Franklin Street - 16th Floor Room 1678 Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie-Niagara Regional Counties Planning Board 2085 Baseline Road Grand Island, NY 14072	27 Nov. 74	No Comment Received
Erie County Department of Public Works Division of Highways 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Department of Parks and Recreation Erie County Office Building 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Environmental Management Council Erie County Office Building Room 1678 95 Franklin Street Buffalo, New York 14202	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
Department of Environmental Quality of Erie County Erie County Office Building 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Department of Health Edward A. Rath Building Room 910 95 Franklin Street Buffalo, New York 14202	27 Nov. 74	No Comment Received
City of Buffalo Department of Public Works Room 502 City Hall Buffalo, NY 14202	27 Nov. 74	No Comment Received
Mayor, City of Buffalo City Hall Room 201 65 Niagara Square Buffalo, NY 14202	27 Nov. 74	No Comment Received
Buffalo and Erie County Historical Society 25 Nottingham Court Buffalo, NY 14216	27 Nov. 74	No Comment Received
Erie County Water Authority 350 Ellicott Square Building Buffalo, NY 14203	27 Nov. 74	No Comment Received
Great Lakes Laboratory State University College at Buffalo Campus School, Room 332A 1300 Elmwood Avenue Buffalo, NY 14222	27 Nov. 74	No Comment Received
Environmental Clearing House Organization Buffalo Museum of Science Humboldt Parkway Buffalo, NY 14222	27 Nov. 74	No Comment Received
League of Women Voters Lake Erie Basin Committee 50 Sweetwood Drive Tonawanda, NY 14150	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
National Audubon Society Central Midwest Regional Office Route 1, Box 19 Mauckport, IN 47142	27 Nov. 74	No Comment Received
Sierra Club 175 Nottingham Terrace Buffalo, NY 14216	27 Nov. 75	No Comment Received
Water Quality Task Force of Housewives to End Pollution 590 Mt. Vernon Boulevard Hamburg, NY 14075	27 Nov. 74	No Comment Received
Town of West Seneca Supervisor 1250 Union Road West Seneca, NY 14224	27 Nov. 74	No Comment Received
Town of Aurora Supervisor 5 South Grove Street East Aurora, NY 14052	27 Nov. 74	No Comment Received
Mayor of East Aurora 571 Main Street East Aurora, NY 14052	27 Nov. 74	No Comment Received
Erie County Federation of Sportsmen 221 Courtland Avenue Buffalo, NY 14215	27 Nov. 74	No Comment Received

9.09 The following agencies commented on the Revised Draft Environmental Statement:

Department of Housing and Urban Development Buffalo Area Office Grant Building 560 Main Street Buffalo, NY 14202		14 Sep. 76
U. S. Environmental Protection Agency Region II 26 Federal Plaza New York, NY 10007		1 Oct. 76

Agency	Date of Request	Date of Comment
U. S. Department of Health, Education and Welfare Office of the Secretary Washington, DC 20201		6 Oct. 76
U. S. Department of Agriculture Office of the Secretary Washington, DC 20250		29 Oct. 76
U. S. Department of the Interior Office of the Secretary Washington, DC 20240		5 Nov. 76
U. S. Department of Transportation United States Coast Guard Washington, DC 20590		11 Nov. 76
State of New York Department of Environmetnal Conservation Albany, NY 12233		13 Jan. 77

9.10 Comments received on the Draft Environmental Statement and Revised Draft Environmental Statement as well as Corps responses to these comments follow:

COMMENTS AND RESPONSES
ON THE
DRAFT ENVIRONMENTAL STATEMENT

U. S. DEPARTMENT OF TRANSPORTATION -- FEDERAL HIGHWAY ADMINISTRATION

(Letter dated 10 December 1974)

COMMENT:

Due to the nature of the project, we have determined that there will be no effect on the Federal-aid system in this area. Therefore, we have no comments on the environmental impacts.

RESPONSE:

No response necessary.

COMMENT:

Since the New York Division of FHWA is assigned the responsibility of reviewing impact statements for Federal projects within New York State, please send the statements directly to:

Victor E. Taylor, Division Engineer
Federal Highway Administration
16 Russell Road
Albany, NY 12206

RESPONSE:

Future statements will be sent to the above address as requested.

U. S. DEPARTMENT OF THE INTERIOR - BUREAU OF OUTDOOR RECREATION

(Letter dated 9 January 1975)

COMMENT:

We believe that construction of a concrete ice retention dam as proposed could increase public outdoor recreation opportunity in two distinct ways. The first involves the dam itself, and the eight-foot pool expected to form behind it. We note that average pool area will be five acres, and that an additional 10 acres will be restored by grading and vegetative plantings. It appears that development of a small, day-use recreation area may be feasible, with swimming, picnicking, fishing and canoeing (possibly) being the principal uses. In addition, public access to Cazenovia Creek for these and other purposes would be increased. We recommend that the Corps of Engineers consult with local recreation and park officials concerning any interest the latter may have in establishing and operating such a recreation area, and that the final statement include information regarding the results of such consultation.

RESPONSE:

The recommended plan providing for an ice retention structure includes options for operation. Specifically, the plan provides for either maintenance of a permanent pool year-round, or maintenance of a temporary pool to serve only the intended ice retention function. During advanced engineering and design study, the Corps will coordinate with local interests in development, operation and maintenance of recreation measures.

COMMENT:

Secondly, public recreation opportunity of a somewhat different nature could, with proper planning, result from project implementation. Specifically, the dam site and recreation area discussed above could serve as a link between existing and proposed recreation facilities both downstream and upstream from it. We note, for example, the existence of Cazenovia Park downstream from the proposed dam, and also Isle View County Park - a 53 acre recreaton area located still further downstream. Also, we note in Appendix B of the draft statement that the State has considered two tracts upstream from the project area for acquisition for State park purposes. The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of the statement.

RESPONSE:

The Erie-Niagara Counties Regional Planning Board has a Regional Recreation Plan which includes trailways along both sides of Cazenovia Creek in the vicinity of the project area. The proposed flood control project would be compatible with the Erie-Niagara Counties Regional Planning Board's plans.

U. S. DEPARTMENT OF THE INTERIOR - BUREAU OF MINES
(Letter dated 13 January 1975)

COMMENT:

Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. Our sources indicate that these mineral resources are widespread throughout Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be affected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated. A sentence or so to that effect should be included in the statement, otherwise we foresee no need for additional comment from the Bureau of Mines.

RESPONSE:

The environmental statement has been expanded in Section 2 under the general topic of Geological Investigation in response to the comment.

U. S. DEPARTMENT OF THE INTERIOR - NATIONAL PARK SERVICE
(Letter dated 16 January 1975)

COMMENT:

As requested by our Departmental Office of Environmental Review Coordination, we are commenting directly to you upon our review of the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, NY. We understand from our Departmental directive that a revised Draft Environmental Statement is forthcoming on this project.

RESPONSE:

No response necessary.

COMMENT:

As indicated in Appendix B, we have followed this project closely. We would take this opportunity to acknowledge receipt of your letter of 30 December wherein you report Dr. White's archeological literature search of the project area and also that Mr. Aldrich, State Historic Preservation Officer and Dr. Funk, State Archeologist have each received copies of this Draft Environmental Statement for comment.

RESPONSE:

No response necessary.

COMMENT:

We are pleased at the Corps' cooperative endeavors of cultural resource matters in this case. We would fully expect Mr. Aldrich and Dr. White and Dr. Funk to provide all necessary information and advice for the Corps to have adequately considered and properly acted to protect cultural resources in the project area. Further, we would expect to see their comments and hope to find the discussion of the Corps' favorable reaction to them in the revised Draft and/or Final Environmental Statement.

RESPONSE:

The Corps would respond to any comments received on the Draft Environmental Statement from Mr. Aldrich, Dr. White and Dr. Funk. Responses to any such comments received would be incorporated into the revised Draft Environmental Statement.

COMMENT:

It is our feeling that inasmuch as the DES indicates the probability (p. 77) of archeological sites in the project area, that on-site archeological surveys should be made in addition to the literature search which has been performed. Such surveys can reveal archeological materials prehistoric information not yet recorded. For further consultation on such survey, we suggest contacting Mr. Thomas King, Executive Director, New York State Archeological Council located at the Department of Anthropology, SUNY at Buffalo, 4242 Ridge Lea Road, Amherst, NY 14426.

RESPONSE:

Mr. Thomas King's letter to the District Engineer dated 6 February 1975 points out that a sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgments of archaeological significance would appear to be appropriate at this level of planning. Mr. King's letter is included in Appendix A entitled "Letters of Comment." Corps responses to comments from the New York Archaeological Council immediately follow this paragraph.

U. S. DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE
(Letter dated 6 January 1975)

COMMENT:

(1) Page 51, paragraph 2.71 states

". . . the chief nutrient sources are thought to come from fertilizer enriched agricultural runoff and from sewage effluent entering the creek generally upstream of West Seneca."

Although we recognize that the word "thought" is used, is it proper to think the chief source of nutrients is, among others, "fertilizer enriched agricultural runoff?"

When considering the point SANITARY DISCHARGES shown on Table 16, page 47, and some of the sharp rises of nutrients as shown on plates 13, page 53 and 14, page 54, it is not easy for the reviewer to relate nonpoint agriculturla fertilizer enriched runoff as a chief source of pollution.

RESPONSE:

The statement has been modified in paragraph 2.71 in response to the comment.

COMMENT:

(2) Page 89, paragraph 2.141

First sentence - regarding the use of the phrase "decline of agriculture" - a better wording for this sentence might be:

> "Urbanization and changing land use from agriculture to other uses is expected to continue in this basin."

RESPONSE:

Paragraph 2.141 has been expanded in the environmental statement in response to the comment.

COMMENT:

At least one meaning of "decline" is a wasting away or sinking to an inferior state which does not accurately describe agriculture in this area.

RESPONSE:

Paragraph 2.141 has been amended in the environmental statement in response to the comment.

COMMENT:

(3) Page 90, Plate 18

The legend for this master plan lumps "agricultural or vacant land." The use of "vacant land" does not seem appropriate. Presumably vacant land could include open space, land formerly cropped, wildlife land, woodland, and others.

It is not clear whether the legend applies only to the vicinity of the creek or the entire map. We find it difficult to find any farmstead symbols on this map.

RESPONSE:

Plate 18 illustrates the Erie-Niagara Counties Regional Planning Boards land use master plan. Since the plate was obtained from another agency's report, any suggested changes to its format should be directed to that agency.

COMMENT:

Page 96, paragraph 2.175

Discusses the status of improvement and riprap and vegetative work completed or being done by SCS. As worded, the paragraph is not completely accurate. A better wording for this section would be:

> "SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek).
>
> "The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties.
>
> "SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities."

RESPONSE:

Paragraph 2.175 has been expanded in the environmental statement in response to the comment.

COMMENT:

Page 121, paragraph 4.03 TRANSIENT IMPACT

This paragraph could be improved by stating that measures to control soil erosion during construction will be undertaken. These would include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measure, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation.

RESPONSE:

Paragraph 4.04 has been expanded in the environmental statement in response to the comment.

U. S. DEPARTMENT OF THE INTERIOR - FISH AND WILDLIFE SERVICE
(Letter dated 7 March 1975)

COMMENT:

The following comments are provided on the draft environmental statement for the Cazenovia Creek Flood Control proposal.

RESPONSE:

The comments have been received and responses to comments are indicated below.

COMMENT:

We understand that the subject report and a revised draft environmental statement will be subject to Departmental review at a later date.

RESPONSE:

The revised environmental statement will be coordinated with the Department of the Interior.

COMMENT:

Our comments are provided as a result of informal field review. They are submitted by the U. S. Fish and Wildlife Service as technical assistance, and are not the views of the U. S. Department of the Interior. Further review will be undertaken by this service during the Departmental review process when the Departmental position will be provided.

RESPONSE:

No response necessary.

COMMENT:

In paragraph 1.03 the proposed plan for Tannery Brook states, "No structural measure was found to be feasible, hence floodplain management is recommended". In this instance it seems that the statement should be revised to present floodplain management as the best feasible alternative. It is possible from a planning standpoint that even if a structural measure were feasible, floodplain management could be a better alternative. For all the floodplain management recommendations it would be very helpful if the discussion included information relative to why floodplain management is recommended and not required. This would be particularly useful where floodplain management is an integral part of the project and where development should be restricted even with the ice retention structure.

RESPONSE:

During a public meeting held 11 December 1959, the mayor of the Village of Aurora asked for whatever assistance could be offered to divert the inherited water (from the watershed of Tannery Brook above the village) so that we can take care of our own (water within the village limits). The villages appeal was for a structural measure of some kind to provide flood protection for existing properties. Floodplain management would not provide the desired protection for existing properties and, therefore, is not a feasible alternative to structural measures which could.

Floodplain management can be enforced only by local governments. The Federal Insurance Administration stipulates the conditions under which constituents of local governments might qualify for Federally subsidized flood insurance and Federal funding assistance; however, local governments decide whether they care to comply with such stipulations. Accordingly, the Corps can only recommend such compliance; it cannot require it.

COMMENT:

Paragraph 2.78 presents data on the aquatic plant life, but does not make reference to field investigations or studies conducted to obtain the data. Descriptions of plant or animal life should contain appropriate information and/or references to the methods used to obtain the data and other pertinent information including the time of the sampling or study, locations or areas covered, and conditions encountered.

RESPONSE:

Paragraph 2.78 has been revised indicating the source of data. The reference "1973 Erie County Stream Survey", is primarily concerned with water quality variables and simply lists commonly observed, identified, aquatic plants as accessory information. No filed data is presented with the plant lists in this publication.

COMMENT:

In paragraph 2.84 the source of the surveys conducted in 1958 and 1967 should be identified. Table 21 should contain the appropriate reference.

RESPONSE:

Paragraph 2.84 has been revised accordingly indicating the source of the surveys. Note that the original survey was conducted in 1956 not 1958. Table 21 has been revised accordingly.

COMMENT:

Paragraph 2.87 discusses vegetation in the Cazenovia Creek area, stating, "A comprehensive listing of vegetation found in Cazenovia Basin is given in Table 22". Table 22 does not present a comprehensive list of the vegtation in the Cazenovia Creek Basin. A survey of the vegetation in the project area would be more relevant. This is important because the list in Table 22 includes Euonymus obovatus Nutt., Running Strawberry Bush, which is a protected native plant in New York State pursuant to the New York State Environmental Conservation Law, Section 9-1503. The project area should be surveyed to see if this protected species is, in fact, present.

RESPONSE:

At the present time a vegetation survey in the project area is not possible. A short-term survey of vegetation in the project area will be performed by a Corps Ecologist during the summer of 1975. If funds are appropriated for future, more comprehensive field surveys, the possibility of a botanic study would be considered.

COMMENT:

Paragraphs 2.91 - 2.106 discuss wildlife and endangered species. Project specific surveys and listings and then determinations as to the status of the species present should be presented in the statement.

RESPONSE:

Presently funds are not available to conduct wildlife field surveys in the project area. The listings and discussions given in these sections are for information purposes. Listed are all wildlife and endangered species ever observed in the general project area. Admittedly, the status of these species cannot be determined from the data presented.

COMMENT:

Section 2.148 describes the environment in the vicinity of the proposed ice retention structure. Consideration of this area should include the results of the vegetation survey in the proposed structure and pool area.

RESPONSE:

The suggested consideration of vegetation in the area of the proposed ice retention structure will be given if funds are appropriated for further project field investigations.

COMMENT:

Section 4 regarding the impacts of the proposal may need to be revised after the vegetation in the ice retention structure area has been investigated. The same may hold true for Section 5.

RESPONSE:

It is acknowledged that collection of original field data on vegetation in the project area would probably require revision of the above mentioned Sections.

U. S. ENVIRONMENTAL PROTECTION AGENCY - REGION II

(Letter dated 27 January 1975)

COMMENT:

EPA is in agreement with the Corps' use of nonstructural measures to help control flooding hazards. Nonstructural measures can reduce the potential economic impacts of flooding while at the same time they allow the floodplain to continue its natural functions.

RESPONSE:

No response necessary.

COMMENT:

The EIS mentions that the turbidity and sedimentation resulting from construction and maintenance programs could destroy spawning beds and smoother benthic organisms. The final EIS should discuss the type and extensiveness of the spawning beds which are located in the project area.

RESPONSE:

The revised environmental statement has been expanded in response to the comment. Additional information on the fishery in Cazenovia Creek, Town of West Seneca, was requested by the Corps from the New York State Department of Conservation, Region 9 Division of Fish and Wildlife. Information received from that agency has been inserted into Appendix B entitled, "Letters of Coordination" and includes results of electrofishing sampling and also spawning data on Cazenovia Creek.

COMMENT:

Ice-breaking methods have been used fairly successfully in the past to prevent ice jams which produce flooding hazards. Will the dam remove this necessity or will ice breaking still be required in certain areas, such as below the Cazenovia Street Bridge? In other words will ice-jamming floods still be possible below the dam? If so, then how often will they occur and how do they affect the need for the dam?

RESPONSE:

Although ice-affected floods would be possible downstream from the considered ice retention structure, the probability of such floods would be reduced greatly by the structure. With the ice retention structure functioning only that ice formed in the lower 6.4 mile reach of the creek (from the site of the dam of the structure to the mouth of the creek) would contribute to jamming. The probability and extent of jamming in the lower portion are functions of ice production on the full 6.4 mile reach - and such ice production is small in light of the creek's ability to conduct it - the probability of ice jamming in the downstream portion would be small. Furthermore, in light of past and intended effort by the City of Buffalo to straighten and greatly reduce the roughness of the lower 1.2 mile portion of this 6.4 mile reach, the opportunity for ice jamming has been greatly reduced and will be further reduced.

COMMENT:

While summer daytime water quality data are included in the EIS, there are no seasonal or diurnal water quality data. Since this information is required to determine if anoxic conditions could occur in the permanent pool, this information should be included in the final EIS.

RESPONSE:

Because of the general physical configuration of the pool (i.e. - the existing stream channel), flow would continuously occur throughout the entire width and length of the pool. While the stilling pool is forming, outflow would occur through the only partially closed drain conduits. Although this outflow would be somewhat less than inflow, it would be continuous. Once the stilling pool forms, fluctuating stream flow common at the time of year that the ice retention structure is needed would tend to help purge the pool area. With reference to the above comment, although the Corps recognizes that additional water quality data may be of value to determine anoxic conditions in a permanent pool, the stilling pool area used to form the ice retention structure would not be a permanent pool. Also, continuous outflow of stream water is expected to occur during the time of stilling pool formation; therefore, anoxic conditions are not anticipated to occur in the proposed project area.

COMMENT:

Thank you for the opportunity to review this EIS. Three copies of the final EIS are requested for subsequent review.

RESPONSE:

Upon completion of the final EIS, three copies will be mailed to the U. S. EPA - Region II office as requested.

NEW YORK STATE PARKS AND RECREATION DEPARTMENT
(Letter dated 10 March 1975)

COMMENT:

The Division for Historic Preservation, functioning in its capacity as the staff of the State Historic Preservation Officer, has reviewed both the archeological literature survey and the Draft Environmental Statement concerning Cazenovia Creek.

RESPONSE:

No response necessary.

COMMENT:

Please note that the Draft Environmental Statement contains one discrepancy. In the summary statement, it is mentioned that the Federal Register was consulted for National Register listings and that none exist in the vicinity of the proposed project work. Page 77 (sec. 2.121) mentions the Millard Fillmore birthplace. The birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Register of Historic Places.

RESPONSE:

The summary and paragraph 2.121 have been revised accordingly.

COMMENT:

The literature survey and the DEIS as it reflects that search appear to be adequate as evidence of a preliminary investigation. However, on the basis of Dr. White's research, we recommend that further archeological work be done. On-site archeological surveys should be made in the project locations where the land will not be disturbed in any way.

RESPONSE:

At the present time, consideration is being given by the Corps for appropriating funds for a comprehensive archeological survey of the Cazenovia Creek project area. The services of a professional archeologist will be contracted for this survey.

STATE OF NEW YORK DEPARTMENT OF HEALTH - REGIONAL OFFICE
(Letter dated 9 December 1974)

COMMENT:

The area involved has suffered considerably in past years from flood damage and the proposed project would provide much needed relief.

RESPONSE:

No response necessary.

COMMENT:

Cazenovia Creek is not utilized as a source for municipal water supply. Residents along the upper reaches of Cazenovia Creek derive their water supply from individual wells and springs. In either case, the proposed project will have no adverse affect on the quality and quantity of drinking water to the communities and residents involved.

RESPONSE:

No response necessary.

COMMENT:

The plan provides added protection to the public through land use controls by flood plain zoning and subdivision regulations. Through proper municipal planning and zoning, additional recreational benefits can also be derived.

RESPONSE:

No response necessary.

COMMENT:

This office supports the project as it fulfills an immediate and serious need.

RESPONSE:

No response necessary.

COMMENT:

I recommend that the Erie County Health Department be given an opportunity to review and comment on the study.

RESPONSE:

The Erie County Health Department has been sent a copy of the Draft Environmental Statement in November 1974 for review and comment.

NEW YORK ARCHAEOLOGICAL COUNCIL
(Letter dated 6 February 1975)

COMMENT:

I have recently received a copy of your Draft Environmental Statement on the Feasibility Study of Cazenovia Creek, and also a copy of the comments provided you on 16 January by the Department of the Interior requesting on-site archaeological surveys during preparation of the Final Environmental Statement.

RESPONSE:

No response necessary.

COMMENT:

I assume from my perusal of the Draft that you are engaged in a General Investigation on Cazenovia Creek and are not yet approaching preparation of a General Design Memorandum.

RESPONSE:

The Corps is presently engaged in a General Investigation on Cazenovia Creek. Further study to implement the recommended plan would be accomplished, provided the project is authorized for construction by the Congress.

COMMENT:

A sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgments of archaeological significance would appear to be appropriate at this level.

RESPONSE:

No response necessary.

COMMENT:

We would be happy to prepare a proposal for such a study, or for any more intensive work you think necessary to your planning. Please feel free to contact me about this or other projects at the address and phone number given below.

RESPONSE:

The services of a qualified professional archaeologist will be considered to make the archaeological field survey for the proposed project. Federal procurement regulations would be followed in obtaining such services.

THE STATE EDUCATION DEPARTMENT, ALBANY, NY - NYS MUSEUM & SCIENCE SERVICE
(Letter dated 18 February 1975)

COMMENT:

We have reviewed the Draft Environmental Impact Statement for the Cazenovia Creek flood control project and the report on cultural resources prepared by Dr. White, S.U.N.Y. Buffalo.

RESPONSE:

No response necessary.

COMMENT:

Given the characteristics of both the area and of the project itself, we recommend that an archeological survey be carried out prior to construction, conducted by professional archeologists experienced in such work.

RESPONSE:

The Buffalo District is currently in the process of developing a program to determine presence of cultural resources in the District's proposed project areas. The proposed Cazenovia Creek project area will be investigated to determine if any significant archaeological resources exist.

COMMENT:

We suggest that you negotiate directly with Dr. White for the completion of such a survey, and that you keep us apprised of the progress of this procedure.

RESPONSE:

The services of a qualified professional archaeologist would be considered to make the archaeological field survey for the proposed project. Federal procurement regulations would be followed in obtaining such services. When the survey is done, the Buffalo District office will keep you appraised of its progress as requested.

COMMENT:

We will be glad to review further any aspects of this process as you may desire, and feel free to contact us at any time.

RESPONSE:

Your consideration and interest in cultural resource evaluation on the proposed project is appreciated. The Corps District Office will continue to coordinate with the State Archaeologist on its projects in New York State.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

(Letter dated 20 February 1975)

COMMENT:

Erosion control measures and vegetative plantings should be installed on disturbed areas immediately upon completion of construction in order to minimize siltation in the stream. Temporary erosion control measures should be used if disturbed areas are to be left unprotected for any considerable length of time.

RESPONSE:

Removal of vegetation would temporarily expose soils along Cazenovia Creek to climatic elements such as wind and rain, until new ground cover plantings and natural plant invasions are reestablished on the project site. However, exposure of soil would be temporary because disturbed soils along the streambank would be promptly planted to vegetation. This would be done by preparation of a seedbed, fertilization and mulching with hay or straw. Use of some trees and shrubs would also be considered. Vegetation selected for planting would be based on species adaptable to soils and climatic conditions for the general locale, in order to help mitigate adverse environmental effects on the aesthetic appearance and wildlife cover in the project area. Advice as to most suitable vegetative plantings for use on soil types in the project area would be coordinated with the local soil conservation service office.

Also, negative environmental impacts of the proposed structural flood control measure would be mitigated during construction to some extent in that, the Contractor would be required to abide by contract specifications which includes a section on protection of the environment. General requirements are outlined in the "Civil Works Construction Guide Specifications for Environment Protection (CE 1300, June 1973)." The Contractor would be required to have water-tight equipment, including coamings, which must be maintained in order to prevent spillage of oils and excavated materials. In addition, the Contractor would be required to prevent or control siltation, air pollution, erosion, spillage (including accidental), disposal, turbidity and maintenance of any pollution control facilities deemed necessary for the duration of the project. Other environmental protection measures to reduce potential erosion and to mitigate aesthetic impact would also be implemented during and after costruction. This would include protection of disturbed soil by mulching and vegetative plantings.

COMMENT:

Consideration should be given to planting vegetation to compensate for lost wildlife habitat. Planting wildlife shrubs and conifers in open areas adjacent to the dam and a shrub corridor around the north end of the dam would have a mitigating effect on wildlife.

RESPONSE:

Planting of vegetation to compensate for lost wildlife habitat, such as planting of appropriate wildlife shrubs and conifers, will be given consideration as recommended in the above comment. The New York State Department of Environmental Conservation and U. S. Soil Conservation Service would also be consulted in selection of vegetation species best adaptable to growing conditions in the general project locale.

COMMENT:

Provisions should be made to minimize land clearing and construction activities during the period that bird and mammal reproductive nesting occurs. This activity normally occurs between 1 May and 30 June.

RESPONSE:

Plans and specifications for construction of the proposed project would contain provisions to help mitigate disturbance of bird and mammal nesting habitat during the May - June nesting period. Such provisions would include minimization of land clearing and construction activities where possible.

COMMENT:

The statement indicates that the ice retention pool will be periodically drained for sediment removal. However, sedimentation rates, which will affect the frequency of sediment removal, and disposal sites for the removed sediment should be discussed. The USDA Soil Conservation Service has recently completed an Erosion and Sediment Inventory (E.A.S.I.) for New York and should be consulted for determining the sediment load that can be expected at the ice retention structure.

RESPONSE:

The stilling pool of the ice retention structure would exist only shortly before and during periods (late winter and early spring of each year) that ice floes are likely. During any other period, the stilling pool would have little effect on flood management and, therefore, could be drained. Even though local parties may choose to maintain a permanent pool, little sedimentation would be likely. Objectives pursued in design of sediment basins include providing a long shallow stilling pool (to permit settlement of small particles which settle slowly), and reducing flow velocities and maintaining them as constant as possible (to reduce turbulence which inhibits sedimentation). The proposed ice retention structure provides for only the first parts of the two objectives - its stilling pool is long and would tend to reduce flow velocities.

Because the magnitudes of flow fluctuate widely during the period that ice floes are likely, most material that might settle is expected to be scoured later and borne downstream. In view of this, the benefit of possible sedimentation in the pool was not included in the economic evaluation analyses for the proposed project.

Since the rate of scour from the site is expected to nearly equal the rate of sedimentation at the site, the suspended material load of the creek at the site is of minor import.

COMMENT:

The statement recognizes that the pool may be subject to stagnation. It appears from the nature of the stream that the stagnation may be a yearly problem during the summer months. A discussion of the procedures and the agency responsible for monitoring conditions in the pool that favor stagnation should be presented. If the pool is not continually monitored, consideration should be given to draining the pool every year prior to the summer season.

RESPONSE:

As indicated in the previous comment, the stilling pool of the ice retention structure is necessary only shortly before and during periods that ice floes are likely. During these periods (late winter and early spring), stagnation of the pool is unlikely. Should local parties choose to maintain a permanent pool, they could arrange with the New York State Department of Environmental Conservation regarding testing of the pool's water to determine its suitability for any intended uses as well as monitoring of pool conditions.

COMMENT:

The statement should indicate whether construction activities or operation of the project will periodically interrupt stream flow. Measures should be taken to insure that a sufficient flow of water to sustain aquatic life downstream is maintained at all times.

RESPONSE:

The flow of Cazenovia Creek need not be interrupted during construction or operation of the ice retention structure. Although the creek channel at the dam site must be dewatered to enable construction, the creek would be temporarily diverted beforehand to flow continuously during such dewatering and construction. In order to form the stilling pool, the gates of the dam would have to be closed only partially. Accordingly, continuous outflow from the stilling pool would be available to sustain aquatic life of the creek downstream from the site of the ice retention structure.

COMMENT:

Thank you for the opportunity to review this statement. We would like two copies of the Final E.I.S. when it is available.

RESPONSE:

Upon completion of the Final Environmental Statement for the feasibility study of Cazenovia Creek, two copies of the Final Environmental Statement will be sent to your office as requested.

COMMENTS AND RESPONSES
ON THE
REVISED DRAFT ENVIRONMENTAL STATEMENT

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
(Letter dated 14 September 1976)

COMMENT:

A review of the Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed indicates that this project is consistent with HUD objectives and should make residential development more attractive in the Cazenova Creek Watershed Area.

RESPONSE:

No response necessary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

(Letter dated 1 October 1976)

COMMENT:

We have reviewed the Addendum to the Cazenovia Creek Revised Draft Environmental Impact Statement (EIS) concerning archaeological resources and are somewhat confused as to how an addendum to a revised draft EIS can be issued before the revised draft EIS.

RESPONSE:

During review of the Revised Draft Environmental Statement by Corps higher authority, it was determined that a cultural reconnaissance study of the project area was necessary. Therefore, to fulfill the request of higher authority, a literature search and field investigation was conducted, which resulted in preparation of an Archaeological Resource Addendum to be added to the Cazenova Creek Revised Draft Environmental Statement. After review of the Addendum by Corps higher authority, a copy of the Addendum was then forwarded to other agency reviewers.

COMMENT:

Nevertheless, our review of the addendum and an unofficial copy of the revised draft EIS obtained from the Buffalo District Office, indicates that the proposed project should not produce significant adverse environmental impacts.

RESPONSE:

No response necessary.

COMMENT:

In accordance with EPA procedures, we have rated the revised draft EIS and the addendum as LO-1, indicating that we lack objection to the project as proposed (LO) and that the environmental impacts of the project are adequately set forth in the documents (1).

RESPONSE:

No response necessary.

COMMENT:

If you have any questions concerning this letter, please feel free to contact our office at 8-264-8556. A copy of the final EIS is requested for subsequent review.

RESPONSE:

Upon completion of the FEIS on Cazenovia Creek, a copy of the statement will be forwarded to the USEPA office for review as requested.

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

(Letter dated 6 October 1976)

COMMENT:

The Department's New York Regional Office has reviewed the draft environmental impact statement concerning the Cazenovia Creek Watershed, New York. On the basis of this review, we feel that impacts in those areas of concern to this Department have been adequately addressed.

RESPONSE:

No response necessary.

U. S. DEPARTMENT OF AGRICULTURE
(Letter dated 29 October 1976)

COMMENT:

The proposed works involve the ponding of floodwaters to reduce the incidence of ice jamming. However, the area affected by ponding floodwaters is not discussed with the precision that characterizes much of the report. On page 72 (Main Report) we note reference to impacts on "approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland." Presumably, some current farm uses of land will be displaced by the project. A further description of the farmland, the intensity of its use, identification of prime farmland soils, and impacts on these by the project would be appropriate and should also be included in the environmental impact statement.

RESPONSE:

Roughly 45 acres of the 95-acre tract mentioned in the comment letter dated 29 October 1976 contain prime farmland soils. This acreage, located along the north side of Cazenovia Creek (See Soil Survey Map - Plate 11), includes about 9 acres of Hamlin silt loam and 36 acres of Teel silt loam.* Presently, about 9 acres of this prime soil acreage is cropland, 12 acres is grassland (hayland and private yards), and approximately 24 acres is made up of brushland, small evergreen plantings and hardwood tree cover. The remaining 50 acres of the 95-acre tract is idle land, overgrown with weeds and interspersed with shrubs and trees that have invaded the floodplain and adjacent valley banks. The function of the project would be to retain ice to reduce the incidence of ice jamming downstream in Cazenovia Creek - not to pond floodwaters. Presently, the 45 acres of prime farmland soil is subject to seasonal flooding. With the project, flooding of this land would be insignificantly different in areal extent and depth than under existing conditions. Therefore, flooding impact of the project on these floodplain lands would be minimal. Some prime farmland soil would be lost of excavation for the stilling pool immediately upstream from the dam. Approximately 5 acres of Teel silt loam would be removed from potential future use as farmland. Land presently used for crops in the project area is located upstream from the stilling pool excavation zone. This land is within the 100-year floodplain with or without a project.

*Coordination with the U. S. Soil Conservation Service Office in East Aurora, New York on 1 March 1977

U. S. DEPARTMENT OF THE INTERIOR
(Letter dated 5 November 1976)

COMMENT:

Thank you for the letter of 11 August 1976, requesting our views and comments on the draft environmental statement and interim report for Flood Management in Cazenovia Creek Watershed, Erie County, New York. We have reviewed the documents and conclude that they adequately considered those areas within our jurisdiction and expertise. We are especially pleased with the consideration the Corps of Engineers has given to most of our previous comments. However, we wish to reiterate the concern expressed in our letter of 9 January 1975, that "The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the important of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of that statement."

RESPONSE:

The Erie and Niagara Counties Regional Planning Board reviewed the Buffalo Metropolitan Area Interim Report on Flood Management for the Cazenovia Creek Watershed, and transmitted their findings in the form of a statement for Corps consideration. Proposals presented during a public hearing on 21 June 1974 concerning the Feasibility Study of the Cazenovia Creek Interim Report for Flood Control were evaluated and compared to Regional Planning Board Programs - one of these programs was the "Adopted Recreation and Open Space Plan." A copy of the Erie and Niagara Counties Regional Planning Board's transmittal letter dated 22 May 1975 (Page B-12) with the statement (Page B-13) has been included in Appendix B, Letters of Coordination, of this Final Environmental Statement.

COMMENT:

We do not believe the response to this comment, which is included in the subject document, fully addresses our concern. The final statement should include copies of relevant communications with the Erie-Niagara Counties Regional Planning Board attesting to the compatibility of the project with their Regional Recreation Plan. In the event that post-authorization studies indicate that the project site would serve as an important link in a streamside trail system, the project should be designed to incorporate suitable rights-of-way, gradients and such other allowances as are necessary for trail construction. In this way, the project will not merely be compatible with existing plans, but will provide an existing base for the implementation of these plans.

RESPONSE:

The project lands acquired for construction and subsequent maintenance of the proposed ice retention structure on Cazenovia Creek could serve as a terminus for a bike path-nature trail that would interconnect existing public-use facilities. The trailway as proposed by the Corps of Engineers in their Interim Report dated December 1975, would not only provide a trail in the project lands acquired upstream at the proposed dam, but would interconnect Mill Park - a relatively small park in the town of West Seneca - with a large multi-purpose park in the city of Buffalo. This trailway - except for a very small portion along Union Road - would be located mostly along Cazenovia Creek. The proposed trail was discussed and coordinated with the Northeast Regional Office of the Bureau of Outdoor Recreation, who indicated the plan would meet eligibility criteria for matching funds from the land and Water Conservation Fund. The bike and nature trail plan was also fully accepted at a public meeting held on 5 November 1975 conducted to discuss water-related recreational opportunities in the Buffalo Metropolitan Area. The Erie and Niagara Counties Regional Planning Board has been invited to all of the Corps of Engineers meetings regarding the Cazenovia Creek Project and other water-related recreation meetings. A copy of their response to the proposed ice retention structure is included in Appendix B (Pages B-12 and B-13). Their response was not adverse to the bike path or nature trail. Furthermore, the bike path and nature trail would be compatible to the Regional Recreation and Open Space Plan and Program adopted 11 November 1971 and amended 13 April 1972. Any construction of a bike path and nature trail would be fully coordinated with the New York State Office of Parks and Recreation, who would review the plan to determine its compatibility with their Statewide Comprehensive Outdoor Recreation Plan. Their review would include site suitability, rights-of-way, gradient, funding, priorities and other necessary matters related to trail construction.

DEPARTMENT OF TRANSPORTATION - U. S. COAST GUARD
(Letter dated 11 November 1976)

COMMENT:

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

RESPONSE:

No response necessary.

NEW YORK STATE DEPARTMENT OF ENVIROMENTAL CONSERVATION
(Letter dated 13 January 1977)

COMMENT:

This is in reply to your letter of 16 December 1976, and the earlier letter of 9 August 1976, from General Morris regarding the proposed report of the Chief of Engineers on Cazenovia Creek Watershed, New York. Department staff have worked closely with Buffalo District during development of the feasibility report and EIS and have provided detailed comments upon the draft reports.

RESPONSE:

No response necessary.

COMMENT:

The proposed final report reflects the comments provided to the District and this Department has no further comments to offer on behalf of New York State. The State strongly supports the authorization by Congress of the plan proposed by the Chief of Engineers.

RESPONSE:

No response necessary.

APPENDIX A

LETTERS OF COMMENT

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
16 Russell Road
Albany, New York 12206

December 10, 1974
IN REPLY REFER TO:

01-36.2

Byron G. Walker, Major, C. E.
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the draft environmental impact statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York. The statement was transmitted with your letter of 27 November 1974 to our Regional office.

Due to the nature of the project, we have determined that there will be no effect on the Federal-aid system in this area. Therefore, we have no comments on the environmental impacts.

Since the New York Division of FHWA is assigned the responsibility of reviewing impact statements for Federal projects within New York State, please send the statements directly to:

Victor E. Taylor, Division Engineer
Federal Highway Administration
16 Russell Road
Albany, New York 12206

Sincerely yours,

Victor E. Taylor
Division Engineer

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
NORTHEAST REGIONAL OFFICE
Federal Building - Room 9310
600 ARCH STREET
Philadelphia, Pennsylvania 19106

IN REPLY REFER TO:
ER 74/1466

JAN 0 9 1975

Major Byron G. Walker
Deputy District Engineer
U. S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

In response to your request of November 27, 1974, we have reviewed the draft environmental statement prepared for the proposed flood control project on Cazenovia Creek, Erie County, New York.

We believe that construction of a concrete ice retention dam as proposed could increase public outdoor recreation opportunity in two distinct ways. The first involves the dam itself, and the 8-foot pool expected to form behind it. We note that average pool area will be 5 acres, and that an additional 10 acres will be restored by grading and vegetative plantings. It appears that development of a small, day-use recreation area may be feasible, with swimming, picnicking, fishing and canoeing (possibly) being the principal uses. In addition, public access to Cazenovia Creek for these and other purposes would be increased. We recommend that the Corps of Engineers consult with local recreation and park officials concerning any interest the latter may have in establishing and operating such a recreation area, and that the final statement include information regarding the results of such consultation.

Secondly, public recreation opportunity of a somewhat different nature could, with proper planning, result from project implementation. Specifically, the dam site and recreation area discussed above could serve as a link between existing and proposed recreation facilities both downstream and upstream from it. We note, for example, the existence of Cazenovia Park downstream from the proposed dam, and also Isle View County Park - a 53 acre recreation area located still further downstream. Also, we note in APPENDIX B of the draft statement that the State has considered two tracts upstream from the project area for acquisition for state park purposes. The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of the statement.

We appreciate the opportunity to comment upon this draft statement.

Sincerely,

DEPUTY Regional Director

March 3 1849

United States Department of the Interior

BUREAU OF MINES

4800 FORBES AVENUE
PITTSBURGH, PENNSYLVANIA 15213

ER 74/1466

January 13, 1975

Major Byron G. Walker
Deputy District Engineer
U. S. Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

Re: Draft Environmental Statement on proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York

We have reviewed the draft environmental statement and offer the following comments:

Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. Our sources indicate that these mineral resources are widespread throughout Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be affected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated. A sentence or so to that effect should be included in the statement, otherwise we foresee no need for additional comment from the Bureau of Mines.

Sincerely yours,

Robert D. Thomson, Chief
Eastern Field Operation Center

cc: R. S. Babb, Boston, Mass.
B. Blanchard, Washington, D.C.

United States Department of the Interior
NATIONAL PARK SERVICE
NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

JAN 16 1975

District Engineer
Buffalo District
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Sir:

As requested by our Departmental Office of Environmental Review Coordination, we are commenting directly to you upon our review of the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York. We understand from our Departmental directive that a revised Draft Environmental Statement is forthcoming on this project.

As indicated in Appendix B, we have followed this project closely. We would take this opportunity to acknowledge receipt of your letter of 30 December wherein you report Dr. White's archeological literature search of the project area and also that Mr. Aldrich, State Historic Preservation Officer and Dr. Funk, State Archeologist have each received copies of this Draft Environmental Statement for comment.

We are pleased at the Corps' cooperative endeavors of cultural resource matters in this case. We would fully expect Mr. Aldrich and Dr. White and Dr. Funk to provide all necessary information and advice for the Corps to have adequately considered and properly acted to protect cultural resources in the project area. Further, we would expect to see their comments and hope to find the discussion of the Corps' favorable reaction to them in the revised Draft and/or Final Environmental Statement.

It is our feeling that inasmuch as the DES indicates the probability (p. 77) of archeological sites in the project area, that on-site archeological surveys should be made in addition to the literature search which has been performed. Such surveys can reveal archeological materials prehistoric information not yet recorded. For further consultation on such survey, we suggest contacting Mr. Thomas King, Executive Director, New York State Archeological Council located at the Department of Anthropology, SUNY at Buffalo, 4242 Ridge Lea Road, Amherst, New York 14426.

Sincerely yours,

Regional Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place
Cortland, NY 13045

March 7, 1975

Col. Bernard C. Hughes,
District Engineer
U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

The following comments are provided on the draft environmental statement for the Cazenovia Creek Flood Control proposal. We understand that the subject report and a revised draft environmental statement will be subject to Departmental review at a later date. Our comments are provided as a result of informal field review. They are submitted by the U.S. Fish and Wildlife Service as technical assistance, and are not the views of the U.S. Department of the Interior. Further review will be undertaken by this Service during the Departmental review process when the Departmental position will be provided.

In paragraph 1.03 the proposed plan for Tannery Brook states, "No structural measure was found to be feasible, hence floodplain management is recommended". In this instance it seems that the statement should be revised to present floodplain management as the best feasible alternative. It is possible from a planning standpoint that even if a structural measure were feasible, floodplain management could be a better alternative. For all the floodplain management recommendations it would be helpful if the discussion included information relative to why flood plain management is recommended and not required. This would be particularly useful where floodplain management is an integral part of the project and where development should be restricted even with the ice retention structure.

Paragraph 2.78 presents data on the aquatic plant life, but does not make reference to field investigations or studies conducted to obtain the data. Descriptions of plant or animal life should contain appropriate information and/or references to the methods used to obtain the data and other pertinent information including the time of the sampling or study, locations or areas covered, and conditions encountered.

In paragraph 2.84 the source of the surveys conducted in 1958 and 1967 should be identified. Table 21 should contain the appropriate reference.

Paragraph 2.87 discusses vegetation in the Cazenovia Creek area, stating, "A comprehensive listing of vegetation found in Cazenovia Basin is given in Table 22". Table 22 does not present a comprehensive list of the vegetation in the Cazenovia Creek Basin. A survey of the vegetation in the project area would be more relevant. This is important because the list in Table 22 includes *Euonymus obovatus* Nutt., Running Strawberry Bush, which is a protected native plant in New York State pursuant to the New York State Environmental Conservation Law, Section 9-1503. The project area should be surveyed to see if this protected species is, in fact, present.

Paragraphs 2.91 - 2.106 discuss wildlife and endangered species. Project specific surveys and listings and then determinations as to the status of the species present should be presented in the statement.

Section 2.148 describes the environment in the vicinity of the proposed ice retention structure. Consideration of this area should include the results of the vegetation survey in the proposed structure and pool area.

Section 4 regarding the impacts of the proposal may need to be revised after the vegetation in the ice retention structure area has been investigated. The same may hold true for Section 5.

We appreciate the opportunity to comment at this time.

Yours sincerely,

Willard W. Cole Jr.

Willard W. Cole, Jr
Area Office Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
700 East Water Street, Syracuse, New York 13210

January 6, 1975

Major Byron G. Walker
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York, dated November 1974.

Our comments follow:

(1) Page 51, paragraph 2.71 states

> "..... the chief nutrient sources are thought to come from fertilizer enriched agricultural runoff and from sewage effluent entering the creek generally upstream of West Seneca."

Although we recognize that the word "thought" is used, is it proper to think the chief source of nutrients is, among others, "fertilizer enriched agricultural runoff?"

When considering the point SANITARY DISCHARGES shown on Table 16, page 47, and some of the sharp rises of nutrients as shown on plates 13, page 53 and 14, page 54, it is not easy for the reviewer to relate nonpoint agricultural fertilizer enriched runoff as a chief source of pollution.

(2) Page 89, paragraph 2.141

First sentence - regarding the use of the phrase "decline of agriculture" - a better wording for this sentence might be:

> "Urbanization and changing land use from agriculture to other uses is expected to continue in this basin."

At least one meaning of "decline" is a wasting away or sinking to an inferior state which does not accurately describe agriculture in this area.

(3) Page 90, Plate 18

The legend for this master plan lumps "agricultural or vacant land." The use of 'vacant land" does not seem appropriate. Presumably vacant land could include open space, land formerly cropped, wildlife land, woodland, and others.

It is not clear whether the legend applies only to the vicinity of the creek or the entire map. We find it difficult to find any farmstead symbols on this map.

(4) Page 96, paragraph 2.175

Discusses the status of improvement and riprap and vegetative work completed or being done by SCS. As worded, the paragraph is not completely accurate. A better wording for this section would be:

> "SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek).
>
> "The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties.
>
> "SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities."

(5) Page 121, paragraph 4.03 TRANSIENT IMPACT

This paragraph could be improved by stating that measures to control soil erosion during construction will be undertaken. These would include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measure, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation.

We appreciate the opportunity to comment on this proposed project.

Sincerely yours,

Robert L. Hilliard

Robert L. Hilliard
State Conservationist

cc: Kenneth E. Grant, Administrator, SCS, Washington, D.C.
Dr. Fred H. Tschirley, Acting Coordinator, Office of Environmental Quality Activities, Office of the Secretary, USDA, Washington, D.C.
Council on Environmental Quality, Washington, D.C. (5 copies)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

JAN 27 1975

Class. LO-2

Major Byron G. Walker
Deputy District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the draft environmental impact statement (EIS) for the Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Buffalo Metropolitan Area, New York and have the following comments.

EPA is in agreement with the Corps' use of nonstructural measures to help control flooding hazards. Nonstructural measures can reduce the potential economic impacts of flooding while at the same time they allow the floodplain to continue its natural functions.

The EIS mentions that the turbidity and sedimentation resulting from construction and maintenance programs could destroy spawning beds and smother benthic organisms. The final EIS should discuss the type and extensiveness of the spawning beds which are located in the project area.

Ice-breaking methods have been used fairly successfully in the past to prevent ice jams which produce flooding hazards. Will the dam remove this necessity or will ice breaking still be required in certain areas, such as below the Cazenovia Street Bridge? In other words will ice-jamming floods still be possible below the dam? If so, then how often will they occur and how do they affect the need for the dam?

While summer daytime water quality data are included in the EIS, there are no seasonal or diurnal water quality data. Since this information is required to determine if anoxic conditions could occur in the permanent pool, this information should be included in the final EIS.

Thank you for the opportunity to review this EIS. Three copies of the final EIS are requested for subsequent review.

Sincerely yours,

for Paul H. Arbesman
Chief
Environmental Impacts Branch

NEW YORK STATE PARKS & RECREATION South Swan Street Bldg. Empire State Plaza Albany New York 12238 Information 518 474 0456
Alexander Aldrich, Commissioner

March 10, 1975

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Att: NCBED-ER

Re: Feasibility Study of Casenovia Creek
Erie County, New York
Draft Environmental Statement

Gentlemen:

The Division for Historic Preservation, functioning in its capacity as the staff of the State Historic Preservation Officer, has reviewed both the archeological literature survey and Draft Environmental Statement concerning Cazenovia Creek.

Please note that the Draft Environmental Statement contains one discrepancy. In the Summary statement it is mentioned that the Federal Register was consulted for National Register listings and that none exist in the vicinity of proposed project work. Page 77 (sec. 2.121) mentions the Millard Fillmore birthplace. The birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Register of Historic Places.

The literature survey and the DEIS as it reflects that search appear to be adequate as evidence of a preliminary investigation. However, on the basis of Dr. White's research, we recommend that further archeological work be done. On-site archeological surveys should be made in the project locations where the land will be disturbed in any way.

Sincerely yours,

Diana S. Waite

Diana S. Waite
National Register and
Survey Coordinator
Division for Historic Preservation

DSW/LMR/jf

c Dr. Robert E. Funk, State Archeologist
Dr. Ellis E. McDowell, SUNY at Cortland, New York
Mr. John D. McDermott, Compliance Officer, Advisory
Council on Historic Preservation
Mr. Jerry D. Wagers
Dr. Marian White

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Ogden Reid,
Commissioner

February 20, 1975

Mayor Byron G. Walker
Deputy District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mayor Walker:

Draft Environmental Impact Statement
Phase II Feasibility Study for Flood Control
Cazenovia Creek, Erie County, New York
DEC Project No. 915-99-0126

We have reviewed the above noted document and believe that the statement is generally accurate and complete. The following comments are illustrative of our concerns:

1. Erosion control measures and vegetative plantings should be installed on disturbed areas immediately upon the completion of construction in order to minimize siltation in the stream.

   Temporary erosion control measures should be used if disturbed areas are to be left unprotected for any considerable length of time.

2. Consideration should be given to planting vegetation to compensate for lost wildlife habitat. Planting wildlife shrubs and conifers in open areas adjacent to the dam and a shrub corridor around the north end of the dam would have a mitigating effect on wildlife.

3. Provisions should be made to minimize land clearing and construction activities during the period that bird and mammal reproductive nesting occurs. This activity normally occurs between May 1 and June 30.

4. The statement indicates that the ice retention pool will be periodically drained for sediment removal. However, sedimentation rates, which will affect the frequency of sediment removal, and disposal sites for the removed sediment should be discussed. The USDA Soil Conservation Service has recently completed an Erosion and Sediment Inventory (E.A.S.I.) for New York and should be consulted for determining the sediment load that can be expected at the ice retention structure.

5. The statement recognizes that the pool may be subject to stagnation. It appears from the nature of the stream that the stagnation may be a yearly problem during the summer months. A discussion of the procedures and the agency responsible for monitoring conditions in the pool that favor stagnation should be presented. If the pool is not continually monitored, consideration should be given to draining the pool every year prior to the summer season.

6. The statement should indicate whether construction activities or operation of the project will periodically interrupt stream flow. Measures should be taken to insure that a sufficient flow of water to sustain aquatic life downstream is maintained at all times.

Thank you for the opportunity to review this statement. We would like two copies of the Final E.I.S. when it is available.

Very truly yours,

Terence P. Curran

Terence P. Curran
Director of Environmental Analysis

HOLLIS S. INGRAHAM, M.D.
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF HEALTH
REGIONAL OFFICE
584 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

LAVERNE E. CAMPBELL, M.D.
REGIONAL HEALTH DIRECTOR

December 9, 1974

Major Byron G. Walker
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, N.Y. 14207

Re: Phase II Feasibility
Study for Flood Control
Cazenovia Creek
Erie County

Dear Major Walker,

This office has reviewed the draft environmental statement on the above subject project.

The area involved has suffered considerably in past years from flood damage and the proposed project would provide much needed relief.

Cazenovia Creek is not utilized as a source for municipal water supply. Residents along the upper reaches of Cazenovia Creek derive their water supply from individual wells and springs. In either case, the proposed project will have no adverse affect on the quality and quantity of drinking water to the communities and residents involved.

The plan provides added protection to the public through land use controls by flood plain zoning and subdivision regulations. Through proper municipal planning and zoning, additional recreational benefits can also be derived.

This office supports the project as it fulfills an immediate and serious need.

I recommend that the Erie County Health Department be given an opportunity to review and comment on the study.

Very truly yours,

Louis M. Violanti

Louis M. Violanti, P.E.
Regional Director of Public
Health Engineering

LMV/baa

cc: David Barry - Erie County Health Department
Eugene J. Cahalan - Program Planning & Analysis
Dr. Campbell - Buffalo Regional Office

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12224

NEW YORK STATE MUSEUM AND SCIENCE SERVICE
ANTHROPOLOGICAL SURVEY

February 18, 1975

Colonel Bernard C. Hughes
District Engineer
Department of the Army
Buffalo District
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have reviewed the Draft Environmental Impact Statement for the Cazenovia Creek flood control project and the report on cultural resources prepared by Dr. White, S.U.N.Y. Buffalo.

Given the characteristics of both the area and of the project itself, we recommend that an archeological survey be carried out prior to construction, conducted by professional archeologists experienced in such work.

We suggest that you negotiate directly with Dr. White for the completion of such a survey, and that you keep us apprised of the progress of this procedure.

We will be glad to review further any aspects of this process as you may desire, and feel free to contact us at any time.

Sincerely yours,

Robert E. Funk

Robert E. Funk
State Archeologist

REF:dm

New York Archaeological Council

February 6, 1975

District Engineer
Buffalo District
U.S. Army Corps of Engineers
1776 Niagra St.
Buffalo, NY 14207

Dear Sir:

I have recently received a copy of your Draft Environmental Statement on the Feasibility Study of Cazenovia Creek, and also a copy of the comment provided you on January 16 by the Department of the Interior requesting on-site archaeological surveys during preparation of the Final ES. I assume from my perusal of the Draft that you are engaged in a General Investigatio on Cazenovia Creek and are not yet approaching preparation of a General Design Memorandum. A sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgements of archaeological significance would appear to be appropriate at this level. We would be happy to prepar a proposal for such a study, or for any more intensive work you think necessary to your planning. Please feel free to contact me about this or other projects at the address and phone number given below.

Sincerely yours,

Thomas F. King
Administrator

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BUFFALO AREA OFFICE
GRANT BUILDING, 560 MAIN STREET, BUFFALO, NEW YORK 14202

September 14, 1976

Mr. Marvin W. Rees
Executive Director of Civil Works
DAEN-CWP-A
Department of Army
Office of the Chief of Engineers
Washington, D.C. 20314

Dear Mr. Rees:

Subject: Draft Environmental Impact Statement, Buffalo district, Corps of Engineers Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed

A review of the Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed indicates; that this project is consistent with HUD objectives and should make residential development more attractive in the Cazenovia Creek Watershed Area.

Sincerely,

Frank D. Cerabone
Area Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

Class. LO-1

OCT 1 1976

Colonel Bernard C. Hughes
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have reviewed the Addendum to the Cazenovia Creek Revised Draft Environmental Impact Statement (EIS) concerning archaeological resources and are somewhat confused as to how an addendum to a revised draft EIS can be issued before the revised draft EIS.

Nevertheless, our review of the addendum and an unofficial copy of the revised draft EIS obtained from the Buffalo District Office, indicates that the proposed project should not produce significant adverse environmental impacts.

In accordance with EPA procedures, we have rated the revised draft EIS and the addendum as LO-1, indicating that we lack objection to the project as proposed (LO) and that the environmental impacts of the project are adequately set forth in the documents (1).

If you have any questions concerning this letter, please feel free to contact our office at 8-264-8556. A copy of the final EIS is requested for subsequent review.

Sincerely yours,

Barbara Metzger

Barbara M. Metzger
Chief
Environmental Impacts Branch

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

6 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Morris:

The Department's New York Regional Office has reviewed the draft environmental impact statement concerning the Cazenovia Creek Watershed, New York. On the basis of this review, we feel that impacts in those areas of concern to this Department have been adequately addressed.

Thank you for the opportunity to review the document.

Sincerely,

Charles Custard

Charles Custard
Director
Office of Environmental Affairs

best copy available

page tightly bound

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

29 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Office of the Chief of Engineers
Army Corps of Engineers
U.S. Department of the Army
Washington, D.C.

Dear General Morris:

In accordance with your letter of August 9, 1976, we have reviewed the report and the revised draft environmental impact statement on Cazenovia Creek Watershed, New York.

The proposed works involve the ponding of floodwaters to reduce the incidence of ice jamming. However, the area affected by ponding floodwaters is not discussed with the precision that characterizes much of the report. On page 72 (Main Report) we note reference to impacts on "approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland." Presumably, some current farm uses of land will be displaced by the project. A further description of the farmland, the intensity of its use, identification of prime farmland soils, and impacts on these by the project would be appropriate and should also be included in the environmental impact statement.

We appreciate the opportunity to review and comment on these reports.

Sincerely,

Paul A. Vander Myde

PAUL A. VANDER MYDE
Deputy Assistant Secretary

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-76/784 NOV 5 1976

Dear General Morris:

Thank you for the letter of August 11, 1976, requesting our views and comments on the draft environmental statement and interim report for Flood Management in Cazenovia Creek Watershed, Erie County, New York. We have reviewed the documents and conclude that they adequately considered those areas within our jurisdiction and expertise. We are especially pleased with the consideration the Corps of Engineers has given to most of our previous comments. However, we wish to reiterate the concern expressed in our letter of January 9, 1975, that "The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of that statement."

We do not believe the response to this comment, which is included in the subject document, fully addresses our concern. The final statement should include copies of relevant communications with the Erie-Niagara Counties Regional Planning Board attesting to the compatibility of the project with their Regional Recreation Plan. In the event that post-authorization studies indicate that the project site would serve as an important link in a streamside trail system, the project should be designed to incorporate suitable rights-of-way, gradients and such other allowances as are necessary for trail construction. In this way, the project will not merely be compatible with existing recreation plans, but will provide an existing base for the implementation of these plans.

Sincerely yours,

(Sgd) Stanley D. Doremus

Deputy Assistant Secretary of the Interior

Lt. General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

• 11 November 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Dear General Morris:

This is in response to your letter of 9 August 1976 addressed to Secretary Coleman concerning a revised draft environmental impact statement on Cazenovia Creek and Cayuga Creek Watershed, Buffalo, Erie County, New York.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

D. J. RILEY
Captain, U. S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

PETER A. A. BERLE
COMMISSIONER

January 13, 1977

Dear Colonel Creel:

This is in reply to your letter of December 16, 1976, and the earlier letter of August 9, 1976, from General Morris regarding the proposed report of the Chief of Engineers on Cazenovia Creek Watershed, New York. Department staff have worked closely with Buffalo District during development of the feasibility report and EIS and have provided detailed comments upon the draft reports.

The proposed final report reflects the comments provided to the District and this Department has no further comments to offer on behalf of New York State. The State strongly supports the authorization by Congress of the plan proposed by the Chief of Engineers.

Sincerely,

Peter A. A. Berle

Colonel Tilford C. Creel
Assistant Director of Civil Works,
Upper Mississippi Basin and Great Lakes
Department of the Army
Office of the Chief of Engineers
Washington, DC 20314

APPENDIX B

LETTERS OF COORDINATION

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

10 May 1974

Alexander Aldrich, Commissioner
Parks and Recreation
303 South Swan Street Building
Albany, NY 12223

Dear Mr. Aldrich:

We are currently preparing a draft environmental impact statement for proposed improvements on Cazenovia Creek in the Town of West Seneca, Erie County, NY. Major features of the proposed project include construction of levees along the north bank of the creek, approximately between Ridge Road and Mill Road, and realignment of a portion of the existing creek channel that is adjacent to the Southgate residential area.

In order to fully assess the environmental impacts associated with this proposal it is necessary to know what impacts the proposed project will have upon the historical, archaeological and paleontological resources of the West Seneca area, particularly those listed in the National Register of Historic Places. Impacts upon cultural resources, environmental educational landmarks, and natural landmarks must also be considered.

Therefore, we would be most pleased if you would examine the proposed project area and make the appropriate determinations as outlined above. A brief project description and location maps are inclosed for your reference.

We would be most pleased if you would reply by 31 May 1974. If we can be of any further assistance, please do not hesitate to notify us.

Sincerely yours,

Charles T Myers III

CHARLES T. MYERS III
Major, Corps of Engineers
Acting District Engineer

Incl
as stated

NEW YORK STATE PARKS & RECREATION South Swan Street Bldg South Mall, Albany, New York 12223 Information 518 474 0456
Alexander Aldrich, Commissioner

May 22, 1974

Major Charles T. Myers III
Acting District Engineer
Corps of Engineers, Buffalo
District
1776 Niagara Street
Buffalo, NY 14207

Dear Major Myers:

Thank you for the opportunity to comment on your plans for improvements on Cazenovia Creek in the Town of West Seneca, Erie County.

An area on Cazenovia Creek, just upstream of your proposed project area, has been considered for acquisition and development of a state park. The two areas are shown on the attached map of the West Seneca area. We understand that there are also projected Corps of Engineers' projects for this upstream portion of the Creek. We would like to ask that in planning these projects, as well as the present improvement proposal, you consider the probability of a continuous trail system which would utilize the banks of the river. Such a trail system to connect open space areas could be readily accommodated through the use of improvements such as levees, etc.

Again, thank you for informing us concerning this project.

Sincerely,

Ruth Monson

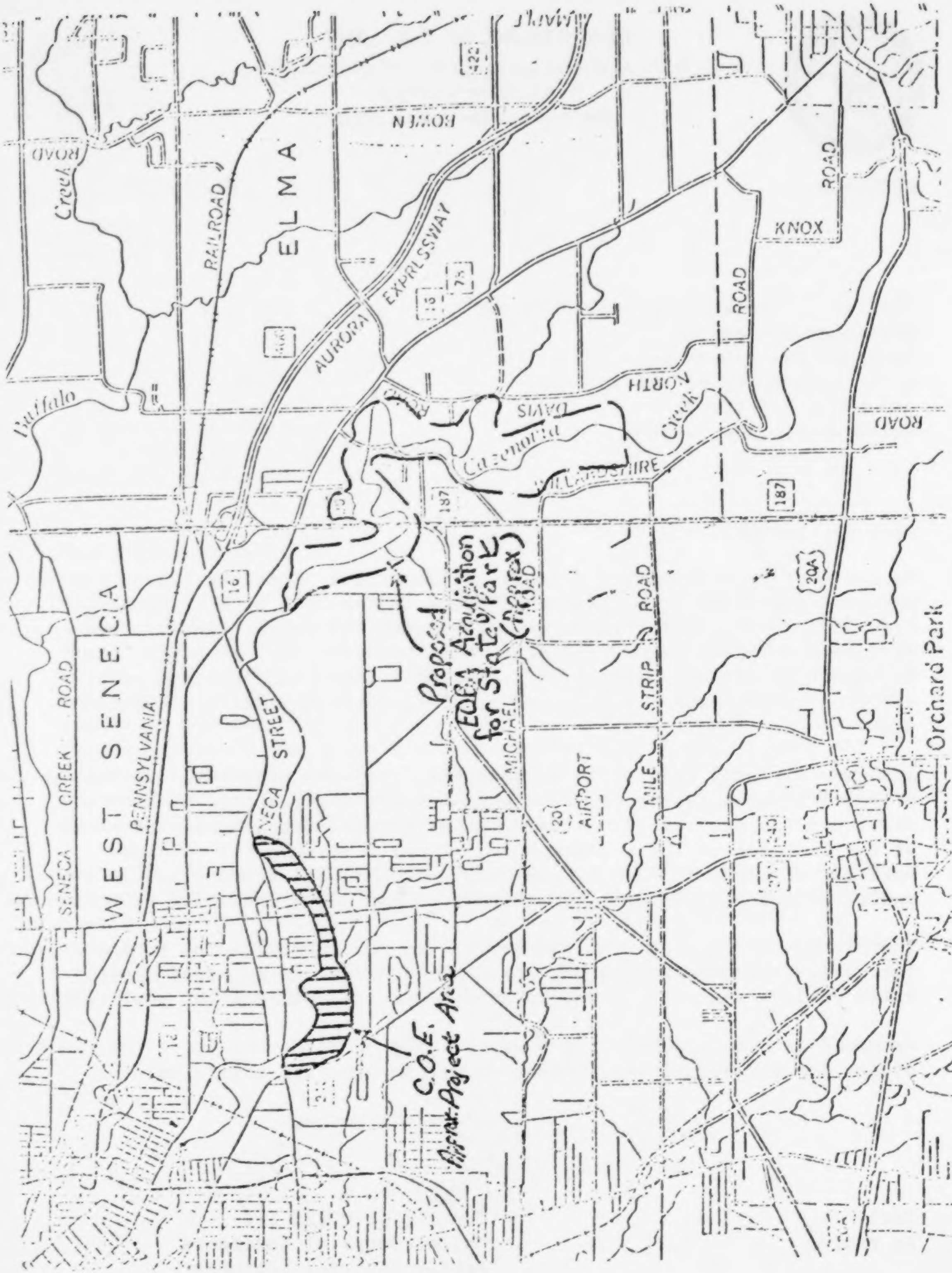
Ruth Monson
Senior Environmental Analyst

for

IVAN P. VAMOS, Director
Planning and Research

RM:kb

Attachment


Buffalo
Creek
SENECA
CREEK
ROAD
WEST SENECA
PENNSYLVANIA
RAILROAD
ELMA
SENECA STREET
AURORA EXPRESSWAY
BOWEN
NORTH DAVIS ROAD
Cazenovia Creek
WILLARDSHIRE ROAD
KNOX ROAD
MICHAEL ROAD
AIRPORT
MILE STRIP ROAD
Orchard Park
16
78
187
20A
20
240
277
400
422
Proposed EDBA Acquisition for State Park (Approx)
C.O.E. Approx. Project Area

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

10 May 1974

Chester L. Brooks, Regional Director
Mid-Atlantic Region
National Parks Service
U. S. Department of the Interior
143 South 3rd Street
Philadelphia, PA 19106

Dear Mr. Brooks:

We are currently preparing a draft environmental impact statement for proposed improvements on Cazenovia Creek in the Town of West Seneca, Erie County, NY. Major features of the proposed project include construction of levees along the north bank of the creek, approximately between Ridge Road and Mill Road, and realignment of a portion of the existing creek channel that is adjacent to the Southgate residential area.

In order to fully assess the environmental impacts associated with this proposal it is necessary to know what impacts the proposed project will have upon the historical, archaeological and paleontological resources of the West Seneca area, particularly those listed in the National Register of Historic Places. Impacts upon cultural resources, environmental educational landmarks, and natural landmarks must also be considered.

Therefore, we would be most pleased if you would examine the proposed project area and make the appropriate determinations as outlined above. A brief project description and location maps are inclosed for your reference.

We would be most pleased if you would reply by 31 May 1974. If we can be of any further assistance, please do not hesitate to notify us.

Sincerely yours,

Charles T Myers III

CHARLES T. MYERS III
Major, Corps of Engineers
Acting District Engineer

Incl
as stated

United States Department of the Interior
NATIONAL PARK SERVICE
NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:
L-7619
NAR-(CE)

JUN 10 1974

Major Charles T. Myers III
Acting District Engineer
Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Myers:

This will confirm a telephone response of June 6 by David Clark of this office to your letter request of May 10, addressed to Chester Brooks, Regional Director of our Mid-Atlantic Region, concerning the preparation of your draft environmental impact statement for proposed improvements on Cazenovia Creek, Town of West Seneca, Erie County, New York. Upon review of the material you sent and consideration of the area of the project, we feel the project would have no adverse affect upon any existing, proposed or known potential units of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs.

We would, however, suggest that you maintain contact with the State Historic Preservation Officer (Commissioner of Parks and Recreation, Room 303, South Swan Street Building, Albany, New York 12226) and this Regional Office regarding archeological matters during the course of the project work, should any unknown cultural resources be revealed and their protection accordingly considered.

Sincerely yours,

Jerry D. Myers.
Regional Director

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

30 December 1974

NCBED-ER

Mr. Alexander Aldrich
Commissioner, New York State Parks and Recreation
303 South Swan Street Building
Albany, NY 12223

Dear Mr. Aldrich:

The Buffalo District Office of the U.S. Army Corps of Engineers is currently preparing a feasibility study of Cazenovia Creek for a proposed flood control project.

Dr. Marian White, Professor of Archaeology at the State University of New York at Buffalo, performed a literature search survey with respect to this proposed project. Inclosed is a copy of the literature survey. The Draft Environmental Statement for the Cazenovia Creek project was forwarded to your office in November.

I would appreciate your comments on the archaeological literature survey and Draft Environmental Statement, and a recommendation as to whether or not additional cultural resource surveys would be required.

Sincerely yours,

Byron G. Walker MAJ, CE
for
BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

1 Incl
as stated

DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

30 December 1974

Dr. Robert Funk
State Archeologist
N.Y.S. Museum & Science Service
Education Building
Room 438
Washington Avenue
Albany, NY 12234

Dear Dr. Funk:

The Buffalo District Office of the U.S. Army Corps of Engineers is currently preparing a feasibility study of Cazenovia Creek for a proposed flood control project.

Dr. Marian White, Professor of Archaeology at the State University of New York at Buffalo, performed a literature search survey with respect to this proposed project. Inclosed is a copy of the literature survey together with a copy of the Cazenovia Creek Draft Environmental Statement.

I would appreciate your comments on the archaeological survey and Draft Environmental Statement, and a recommendation as to whether or not additional cultural resource surveys would be required.

Sincerely yours,

Bernard J. Walker MAJ, CE
BERNARD C. HUGHES
for Colonel, Corps of Engineers
District Engineer

2 Incls
as stated

United States Department of the Interior
NATIONAL PARK SERVICE
NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:
L-7619-NAR-(CE)
NCBED-PB

DEC 9 1974

Colonel Bernard C. Hughes
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

This is in response to your letter of 22 November inviting our comments on the draft Phase II report (a Syllabus and a Feasibility Report) on Cazenovia Creek, New York proposed flood control project. We note extensive discussion given to natural and cultural resources of the project area, particularly cultural on pages 16 and 17 of the Syllabus and pages B-66-68 of the interim (Draft) Feasibility Report.

In keeping with our comments of June 10 to Major Meyers on an environmental statement under preparation for this project, we would suggest that contact be made with the State Historic Preservation Officer to determine what sites, if any, on the state's inventory may be adversely affected by this project. Also, a competent archeological overview should be given to the project area. For this purpose the state archeologist (Dr. Robert Funk, New York State Museum and Science Service, Albany, New York) should be initially contacted and appropriate follow through accomplished from his advice. Should any archeological finds be made or significant possibility be indicated, we can further advise on procedures. The outcome of these cultural resource considerations should be expressed in the environmental statement and any conclusive comments by the State Historic Preservation Officer and Archeologist should be appended to the final statement and also to the draft statement if available.

We anticipate a Departmentally consolidated review of the draft environmental statement on this matter, therefore our comments now must be understood to pertain to the concerns of the National Park Service only.

Sincerely yours,

B-8

Jerry D. Wagers

Jerry D. Wagers
Regional Director

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

30 December 1974

U.S. Department of the Interior
National Park Service
North Atlantic Region
150 Causeway Street
Boston, MA 02114

Dear Mr. Wagers:

With regard to your letter dated 9 December 1974, a literature search of the Cazenovia Creek project area was conducted by Dr. Marian White, Professor of Anthropology at the State University of New York at Buffalo.

A copy of Dr. White's literature search survey has been forwarded to the State Historic Preservation Officer, Mr. Alexander Aldrich, and to the State Archaeologist, Dr. Robert Funk for their review and comment. A copy of the Cazenovia Creek Draft Environmental Statement has also been forwarded to Mr. Aldrich and Dr. Funk.

Upon receipt of comments from the State Historic Preservation Officer and the State Archaeologist, a copy of their assessment regarding natural and cultural resources will be forwarded to your office.

Sincerely yours,

Bernard Hughes

BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

New York State Department of Environmental Conservation
Division of Fish & Wildlife
128 South Street
Olean, New York 14760

February 28, 1975

Colonel Bernard Hughes
District Engineer
1776 Niagara Street
U.S. Army Corps of Engineers
Buffalo, New York 14207

Attn: NCBED-PE

Dear Colonel Hughes:

This letter is a response to your request for information on the fishery in Cazenovia Creek, Town of West Seneca, and is in regard to a proposed ice retention structure upstream of Mill Road Bridge.

The most recent data of interest to you was collected August 14, 1967 when 200 feet of stream were electrofished at Mill Road. The following species of fish were observed along with their relative abundance (A-abundant, C-common, R-rare):

Smallmouth bass	Micropterus dolomieui	C
Rock bass	Ambloplites rupestris	A
Common sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	C
Common shiner	Notropis cornutus	A
Stoneroller minnow	Campostoma anomalum	A
Hornyhead chub	Hybopsis biguttata	R
Stonecat	Noturus flavus	R
Greenside darter	Etheostoma blennioides	R

On June 12, 1973 Cazenovia Creek was electrofished from its mouth upstream to a point approximately 4.5 miles below the location of the proposed ice retention structure. No attempt was made to collect small minnows. Species of fish collected were:

Smallmouth bass	Micropterus dolomieui	C
Sunfish	Lepomis gibbosus	C
Bluegill	Lepomis macrochirus	C
Rock bass	Ambloplites rupestris	R
Sheepshead	Aplodinotus grunniens	C
White sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	R
Redhorse sucker	Moxostoma sp.	C
Carp	Cyprinus carpio	A
Quiliback carpsucker	Carpiodes cyprinus	C

On August 14, 1967, the following species were collected at a point almost three miles upstream of the proposed ice retention structure:

Brown bullhead	Ictalurus nebulosus	R
White sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	C
Common shiner	Notropis cornutus	A
Stoneroller minnow	Campostoma anomalum	A
Longnose dace	Rhinichthys cataractae	C
Creek chub	Semotilus atromaculatus	C
Stonecat	Noturus flavus	R
Greenside dace	Etheostoma blennioides	R

The entire Cazenovia Creek from its mouth to the junction of its East and West Branches, 16.7 miles, is managed for smallmouth bass with the notation that natural spawning is adequate. Both juveniles and adults are commonly observed.

For a nest site, members of the species prefer a firm bottom, usually gravel, in shallow water. When sand, gravel or rock are unavailable, smallmouth bass have been known to use silt, clay or some other soft bottom. More often than not, the location of the nest is adjacent to a protecting bank, log, boulder, or other object. The completed nest is usually a saucer-shaped depression a few inches deep and 2 or 3 feet in diameter. The eggs stick to clean stones or other material in the bottom of the nest.

Our file data lists the bottom type for the section of Cazenovia Creek under consideration as gravel, rubble, silt and bedrock. I do not believe the spawning habitat is limiting to smallmouth bass survival here. Only a few successfully reared broods would be needed to replenish the population anyhow. Other than spawning habitat, ideal stream habitat would include adequate cover and shelter, deep pools alternating with gravel or rocky riffs, and water temperatures that do not exceed 80°F. The numerous wide, shallow bedrock areas of the Cazenovia contribute to summer water temperatures as high as 85°F. Food organisms are less plentiful on a substrate composed purely of this shale bedrock.

I hope this information will be useful to you.

Very truly yours,

James K. Pomeroy

James K. Pomeroy
Conservation Biologist
Region 9

For Charles N. Frisa
Regional Fisheries Mgr.
Region 9

CNF/JKP/dcs

ERIE & NIAGARA COUNTIES REGIONAL PLANNING BOARD

Leo J. Nowak, Jr.
DIRECTOR

Donald P. Lane
CHAIRMAN
Susan R. Greene
VICE CHAIRMAN
H. William Feder
SECRETARY

May 22, 1975

Board of Engineers for Rivers
and Harbors
Kingman Building
Fort Belvoir, Virginia 22060

SUBJECT: Report on Buffalo Metropolitan Area, New York.
Interim Report on Flood Management for
Cazenovia Creek Watershed

Gentlemen:

The staff and the Utilities Committee of the Erie and Niagara Counties Regional Planning Board has reviewed the specified report and is transmitting their findings in the form of a statement for your consideration.

Sincerely yours,

Robert Floyd

Robert Floyd, P.E.
Senior Civil Engineer

RF:sy
Enc.

cc: Col. Bernard C. Hughes, Dist. Eng.
United States Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

ERIE AND NIAGARA COUNTIES REGIONAL PLANNING BOARD STATEMENT FOR THE FEASIBILITY STUDY OF CAZENOVIA CREEK- INTERIM REPORT FOR FLOOD CONTROL

A public statement was presented by Raymond Griffin, Chairman of the Utilities Committee of the Erie and Niagara Counties Regional Planning Board at the Corps of Engineers, Buffalo District public hearing on June 21, 1974.

The proposals presented at this meeting were thoroughly evaluated and compared to the following Regional Planning Board programs:

1. Adopted Land Use Concept
2. Adopted Recreation and Open Space Plan
3. Adopted Regional Water Supply Plan and Program
4. Adopted Regional Sanitary Sewerage Plan and Program
5. Storm Drainage Management Plan

Since the proposals at the June 21, 1974 public hearing included remedial measures and land use controls for Reach 2 and Reach 3, the Regional Planning Board went on record as being in favor of the proposed plans and indicated that the proposed plans were consistent with the Regional Plans and Programs. However, strong emphasis was placed on the fact that a single regional solution consisting of Reach 2 and Reach 3 with the addition of the structural measures for Tannery Brook was more beneficial to the region than solutions for individual and separate reaches as proposed by the Corps of Engineers.

The Regional Planning Board has reviewed the Corps of Engineers' Report on Buffalo Metropolitan Area, New York Interim Report on Flood Management for Cazenovia Creek Watershed, November 1974. The proposals reflected in this report differ to a high degree from the proposals submitted by the Corps of Engineers at the June 21, 1974 Public Hearing. The only structural feature now being proposed is that of an ice retention structure in one segment of the Creek.

After a thorough review, the Regional Planning Board would like to go on record as not being in favor of the proposals in the November, 1974 report because a singular solution in one segment of the Creek is not consistent with the regional programs and plans developed to date.

The Regional Planning Board reiterates its emphasis on a regional solution in order to provide maximum flood protection for the entire watershed of Cazenovia Creek and recommends that the original proposals for the other reaches of the Creek be included in the final report.

NCBED-PN

26 April 1977

Mr. Robert Floyd, P.E.
Senior Civil Engineer
Erie & Niagara Counties Regional
  Planning Board
Northtown Plaza
3103 Sheridan Drive
Amherst, NY 14226

Dear Mr. Floyd:

This letter concerns your letter of 22 May 1975 to the Board of Engineers for Rivers and Harbors and a recent telephone conversation with Mr. Daniel Kelly of my staff concerning the views of the Erie and Niagara Counties Regional Planning Board (ENCRPB) on the Corps recommended flood control project for Cazenovia Creek.

It is my understanding that the ENCRPB is not opposed to the ice retention project but desire a more regional solution to provide additional flood protection in the Cazenovia Creek basin. More specifically, the ENCRPB favors a plan that would include construction of levees in Reach 3 near the Southgate Plaza and structural measures for Tannery Brook in East Aurora.

As shown in our March 1975 Feasibility Report and as discussed with Mr. Kelly, local protection measures for these areas were investigated but in the final analyses were found to be economically unfeasible as independent projects. Corps regulations do not allow us to add up costs and benefits for measures along several separated reaches to arrive at a cost effective project. The measures for each area must be incrementally justified on their own merit.

The ice retention structure, by trapping ice floes moving down Cazenovia Creek, provides a 125-year level of protection in Subreach 3B, where most of the damage occurs, and a lesser degree of protection in other downstream subreaches. No other structural measure considered was as cost effective as the ice retention structure in providing the same or a lesser degree of protection throughout the lower basin. To increase the degree of protection, other measures, in combination with the ice retention structure, were considered to protect against flooding caused by free flows. The only area downstream of the ice retention structure where substantial average annual damages remain is Subreach 1A in the city of Buffalo. Floodwalls were considered in this reach in combination with the ice retention structure but again the floodwalls could not be incrementally justified.

When levees were being considered in the Reach 3 area, a number of residents expressed concern over the visual and environmental impact of constructing levees through the area.

Implementation of the ice retention structure does not preclude non-Corps construction of other measures desired by local interests in the Cazenovia Creek basin.

I would be glad to discuss this matter in greater detail if you wish.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

READEX
FICHE

APPENDIX C

GLOSSARY OF TERMS

AERATION - The process by which air and other gases in a medium are renewed or exchanged.

ALGAE - Small aquatic plants containing chlorophyll and having no vascular conducting system.

ALLUVIUM - Material deposited by running water.

AMORTIZE - To provide for the gradual extinguishment of debt by contributing to a sinking fund at the time of each periodic interest payment.

ANAEROBIC - Condition in which oxygen is absent.

ANNUAL PLANT - Plant having a life span of one year.

AQUIFER - A body of rock strata containing sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

ARGILLACEOUS - Pertaining to Argillite, a compact rock derived from mudstone or shale.

BENTHIC - Relating to or occurring at the bottom of a body of water.

BIOTA - The flora and fauna of a region.

BIOMASS - The amount (mass) of living matter supported by an environment.

BOD - Biochemical oxygen demand; a water quality parameter which specifies the amount of oxygen needed by organisms while consuming organic material in the water.

CFS - Cubic feet per second; 1 cfs = 450 gallons per minute.

CALCAREOUS - Containing calcium carbonate.

CARRYING CAPACITY - The number of animals an area can support over an indefinite period of time.

CLIMAX - The final, self-perpetuating plant and animal community or sere in an ecological succession.

COD - Chemical oxygen demand; a parameter of water quality which specifies the quantity of oxidizable material in a water sample.

COLIFORM - Group of bacteria, primarily inhabitants of the mammalian digestive tract.

COLLUVIUM - Thick, sorted glacially derived deposits.

CONCRETION - A hard, compact, rounded, normally subspherical mass or aggregate of mineral matter formed by precipitation from aqueous solution in pores of sedimentary rock.

DECIDUOUS - Losing all of its leaves yearly at the end of the growing season.

DELTAIC - Associated with deposits dropped at the mouth of a stream or river.

DESIGN DISCHARGE - The quantity of flow in a stream at any given time that a flood control structure is designed to accommodate.

DEVONIAN - The period of geologic time immediately preceding the Pennsylvanian dating approximately from 320 to 270 million years ago.

D.O. - Dissolved oxygen - the amount of oxygen dissolved in water; approximately 4 to 14 parts per million dissolved oxygen are required to support game fish.

ECOSYSTEM - A complex of producer, consumer, and decomposer organisms and their environment, which forms a functioning whole in nature; a rotten log, a pond, or a desert are examples of ecosystems of varying sizes.

EFFLUENT - An outflow.

EPILIMNION - The uppermost layer of water in a lake, characterized by an essentially uniform temperature that is generally warmer than elswhere in the lake and by a relatively uniform mixing caused by wind and wave action.

EUTROPHICATION - Refers to bodies of water, which are rich in mineral nutrients and organic materials, therefore productive. Oxygen may be deficient seasonally.

EVAPOTRANSPIRATION - Loss of water from the soil both by evaporation and by transpiration from plants.

FAUNA - The animal life inhabiting a specific area.

FETCH - The distance of open water across which the wind blows; an important determinant of wave height.

FILAMENTOUS ALGAE - Algae whose cells are joined end to end form tiny filaments.

FLOCCULATION - The aggregation of suspended colloidal material or flat, low-lying area adjacent to a river or stream which is prone to frequent flooding.

FLOODPLAIN - The relatively flat area or lowlands adjoining the channel of a river, stream or watercourse or ocean, which has been or may be covered by flood water.

FLORA - The plant life inhabiting a specific area.

FLUVIO - Associated with running glacial meltwater.

FOOD CHAIN - The passage of energy and materials from producers through a progressive sequence of plant-eating and meat-eating consumers.

FORAGE FISH - A fish species which feeds on plant life and animal remains.

HABITAT - The sum total of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

HYPOLIMNION - The lower most layer of water in a lake, characterized by an essentially uniform temperature, that is generally colder than elsewhere in the lake, and often by relatively stagnant or oxygen-poor water.

KAME & KETTLE - Topography characterized by adjacent hills and depressions, formed by wasting glacial ice.

LACUSTRINE - Descriptive term for material deposited in standing water.

LEACH - To subject to the action of percolating water or other liquid in order to separate the soluble components.

LIMNOLOGY - Study of lakes.

LITTORAL - Of or relating to the shore of a lake or ocean.

MACROPHYTE - A plant that is larger than microscopic.

MARL - A term loosely applied to a variety of materials most of which occur as soft, loose, earthy, and semifriable or crumbling unconsolidated deposits consisting chiefly of an intimate mixture of clay and calcium carbonate in varying proportions, formed under either marine or especially fresh water conditions.

MORAINE - An accumulation of earth and stones carried and finally deposited by a glacier.

NICHE - The position or status or an organism within its ecosystem resulting from the organisms's structural adaptations, physiological responses and specific behavior.

OUTWASH PLAIN - A plain composed of material washed out of a melting glacier. It is usually sandy or gravelly and very flat.

OVERBURDEN - Material which overlies a deposit of useful materials, ores or coal, especially those deposits that are mined from the surface of open cuts.

pH - A measure of the number of hydrogen ions in a solution; if the pH exceeds 7, the solution is considered to be basic, if less that 7, it is acidic.

PASSERINE BIRDS - Passeriformes: Largest order of birds consisting chiefly of song birds with perching habits.

PALEOZOIC - An era of geologic time, from the end of the pre-Cambrian to the beginning of the Mesozoic.

PIEZOMETRIC - An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a well.

PHYTOPLANKTON - Planktonic life belonging to the plant kingdom.

PLANKTONIC - Free floating.

PLEISTOCENE - The glacial age or ice age thought to have begun from 1 to 2 million years ago and ended perhaps 10,000 years ago with the final retreat of the continental glaciers in North America and Europe.

POTABLE - Suitable or safe for drinking.

PRECIPITATE - To cause to separate from solution or suspension.

PREDATOR FISH - Species of fish which prey upon living organisms and other fish.

PYRITE - A common mineral composed of iron and sulphur (FeS_2) commonly called fools-gold.

QUIESCENT WATER - Calm water.

RECENT - Geologic time period following Pleistocene and extending up until the present.

RIPARIAN VEGETATION - Plants which grow along water courses.

RIPRAP - A layer of large rock fragments placed together to prevent erosion by water.

SALINE SOIL - A soil that contains soluble salts, usually chlorides and sulfates in high enough concentration so that the growth of most crop plants is reduced.

SCARP - A steplike ridge.

SEDIMENTARY - Descriptive term for rocks formed of sediments.

SEICHE - An oscillation of the elevation of a lake or inland sea that varies in period from a few minutes to several hours.

SEPTIC - Putrid.

SESSILE - Descriptive term for organisms found attached to a substrate.

SILURIAN - Period in geologic time thought to have begun about 360 million years ago and to have ended about 320 million years ago.

SPOIL - Earth and rock removed by dredging or excavation.

SUCCESSION - The natural, orderly, and predictable replacement sequence of plant and animal communities on a given site, which is reduced by changes in the environment associated with site occupancy by a particular vegetational community.

THALWEG - A line connecting the lowest or deepest points along a streambed or valley. The line of maximum depth.

THERMAL - Of, relating to, or caused by heat.

TILL - Nonsorted, nonstratified sediment carried or deposited by a glacier.

TURBIDITY - The condition of a body of water that contains suspended material such as clay or silt particles, dead organisms, or their parts, or small living plants and animals.

XEROPHYTIC - Low or deficient in available moisture for the support of life.

ZOOPLANKTON - Planktonic organisms belonging to the animal kingdom.

APPENDIX D

PROJECT ECONOMICS

(Revised Draft)

ECONOMIC DATA, EXTRACTED FROM U. S. ARMY CORPS OF ENGINEERS MAIN REPORT - BUFFALO METROPOLITAN AREA, NEW YORK WATER RESOURCES MANAGEMENT, INTERIM REPORT ON FEASIBILITY OF FLOOD MANAGEMENT IN CAZENOVIA CREEK WATERSHED. COMPLETE REPORT IS AVAILABLE AT U. S. ARMY ENGINEER DISTRICT, BUFFALO, NY.

D. COST EFFECTIVENESS OF CONSIDERED MEASURES

D.01 Table D-1 gives data on total costs and benefits, net benefits, and benefit/cost (B/C) ratios for flood control measures considered to warrant economic analysis. Note that out of a total of 16 considered measures, only 3 have B/C ratios greater than 1.0. Therefore, only these 3, floodproofing in Reach 3, a short levee in Reach 3, and an ice retention structure upstream of Reach 3, qualify for inclusion in a basinwide plan of action. Three such plans (Alternatives 1, 2 and 3 respectively) were developed by combining each of these economically viable measures with a basinwide floodplain management and flood insurance plan.

D.02 Detailed Costs for Alternative Plans

D.03 Table D-2 and D-3 give first costs and annual changes for Alternative 1, based upon October 1973 prices and on October 1972 level of development. Annual charges are amortized over a 100-year project life at an interest rate of 5-5/8 percent. Corresponding data for Alternatives 2 and 3 are given in Tables D-4 to D-7. Table D-8 summarizes economic data for the three alternatives.

D.04 Detailed Economic Update for the Recommended Plan

D.05 Alternative 3 was chosen as the recommended plan because it yields the highest net benefits and maximizes the B/C ratio. Upon completion of the selection process, a complete update of prices was undertaken. The costs given below refer to October 1974 prices based upon an October 1972 level of development.

D.06 First Costs

D.07 The detailed estimate of first costs for the recommended ice retaining structure is given in Table D-9. Allowances of 15 percent for lands and damages and 20 percent for all other items were used for contingencies.

D.08 Annual Costs

D.09 Annual costs for the selected plan are based on an interest rate of 5-7/8 percent and an amortization period of 100 years. Since the ice retaining structure could be constructed within one year, interest during construction has not been included. Annual charges for maintenance of the proposed improvements are based on annual installation and removal of the ice boom, occasional structural maintenance, and periodic removal of the sediment trapped behind the dam. The estimated annual costs are presented in Table D-10.

Table D-1

Cost Effectiveness of Considered Measures*

Measure	Reach	Total Average Annual Costs	Total Average Annual Benefits	New Average Annual Benefits	Benefit /Cost Ratio
Floodproofing	1	190,500	28,200(1)	- 162,300	0.15
	2	15,000	9,800(1)	- 5,200	0.65
	3	66,500	92,200(1)	- 25,700	1.39
	Tannery Brook	26,800	14,400(1)	- 12,400	0.54
Levees & Floodwalls	1	94,200	47,900	- 46,300	0.51
	2	42,100	12,300	- 29,800	0.29
(Alignment A)	3B	91,600	93,200	1,600	1.02
(Alignment B)	3	182,600	96,500	- 86,100	0.53
(Alignment C)	3	317,100	124,500	- 192,600	0.39
Reservoirs I	lower basin	1,748,900	341,400	-1,407,500	0.20
near Springbrook II	lower basin	1,628,000	341,400	-1,286,600	0.21
Diversion Channel	Tannery Brook	26,800	14,400	- 12,400	0.54
Ice Retention Structure	Protects Reaches 1, 2 & 3 to varying Degrees	68,600	141,300	72,700	2.06

*Updated to October 1973 price levels based upon October 1972 level of development.

(1) Average annual benefits are adjusted for items which are not prevented by floodproofing, including yard damage and costs of flood emergency operations and post-flood cleanup.

Table D-2

Estimated First Costs for Floodproofing for Reach 3

100-Year Protection

Item	Number	ESTIMATED FIRST COSTS Federal	Non-Federal	Total
Residential Units (Basement flooding)	289	$208,100	$ 52,000	$ 260,100
Residential Units (First flood flooding)	62	297,600	74,400	372,000
Commercial Units	37	222,000	55,500	277,500
Public Units	0			
Supervision and Administrative Costs (10%)		72,800	18,200	91,000
Total First Cost		$800,500	$200,100	$1,000,600
Rounded First Cost		$801,000	$200,000	$1,001,000

Table D-3

Estimated Annual Costs for Floodproofing

Item	ESTIMATED ANNUAL COSTS		
	Federal	Non-Federal	Total
Rounded First Cost	$801,000	$200,000	$1,001,000
Annual Costs			
Interest and Amortization	45,200	11,300	56,500
Maintenance	500	9,500	10,000
Total Annual Cost	$ 45,700	$ 20,800	$ 66,500
Rounded Annual Cost	$ 46,000	$ 21,000	$ 67,000

Table D-4

Estimated First Costs for Levees and Floodwalls for Reach 3

100-Year Protection

Item	ESTIMATED FIRST COSTS Federal	 Non-Federal	 Total
Lands and Damages		$166,800	$ 166,800
Relocations		33,200	33,200
Channel Improvements	$ 207,600		207,600
Levees & Walls	599,800		599,800
Internal Drainage	143,200		143,200
Total Cost (including Contingencies)	$ 950,600	$200,000(1)	$1,150,600(1)
Engineering & Design Supervision & Admin.	218,700	7,600(1)	226,300(1)
Total First Cost	$1,169,300	$207,600	$1,376,900
Rounded First Cost	$1,169,000	$208,000	$1,377,000

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(1) Engineering and Design, Supervision and Administration Costs are not applied to lands and damages.

Table D-5

Estimated Annual Costs for Levees and Floodwalls

Item	ESTIMATED ANNUAL COSTS Federal	Non-Federal	Total
Rounded First Cost	$1,169,000	$208,000	$1,377,000
Annual Costs			
Interest and Amortization	66,000	11,800	77,800
Maintenance	500	13,300	13,800
Total Annual Cost	$ 66,500	$ 25,100	$ 91,600
Rounded Annual Cost	$ 67,000	$ 25,000	$ 92,000

Table D-6

Estimated First Costs for Ice Retention Structure

West Seneca, NY

Item	ESTIMATED FIRST COSTS Federal	 Non-Federal	 Total
Lands & Damages		$218,500	$ 218,500
Clearing & Dewatering	$107,700		107,700
Retaining Structure	414,100		414,100
Internal Drainage	7,200		7,200
Waterproofing Manholes	12,300		12,300
Aesthetic Treatment	33,800		33,800
Ice Boom	90,000		90,000
Total Cost (including Contingencies)	$665,100	$218,500 (1)	$ 883,600 (1)
Engineering & Design Supervision & Admin.	153,000		153,000
Total First Cost	$818,100	$218,500	$1,036,600
Rounded First Cost	$818,000	$219,000	$1,037,000

(1) Engineering and Design, Supervision and Administration costs are not applied to lands and damages.

Table D-7

Estimated Annual Costs for Ice Retention Structure

Item	ESTIMATED ANNUAL COSTS Federal	Non-Federal	Total
Rounded First Cost	$818,000	$219,000	$1,037,000
Annual Costs			
Interest and Amortization	46,200	12,400	58,600
Maintenance	500	9,500	10,000
Total Annual Cost	$ 46,700	$ 21,900	$ 68,600
Rounded Annual Cost	$ 47,000	$ 22,000	$ 69,000

Table D-8

*Economic Data for Alternative Flood Control Plans

Plan of Action	Alternative 1 (1)	Alternative 2 (2)	Alternative 3 (3)
First Costs			
Federal	1,169,000	801,000	818,000
Non-Federal	208,000	200,000	219,000
Total	1,377,000	1,001,000	1,037,000
Annual Operation, Maintenance and Replacement Costs			
Federal	500	500	500
Non-Federal	13,300	9,500	9,500
Total	13,800	10,000	10,000
Average Annual Costs			
Federal	66,500	45,700	46,700
Non-Federal	25,100	20,800	21,900
Total	91,600	66,500	68,600
Total Average Annual Benefits	93,200	92,200	141,300
Net Average Annual Benefits	1,600	25,000	72,700
Benefit/Cost Ratio	1.02**	1.39	2.06

(1) Alternative 1: Levees in Reach 3B, Basinwide Floodplain Management and Flood Insurance

(2) Alternative 2: Floodproofing in Reach 3B, Basinwide Floodplain Management and Flood Insurance

(3) Alternative 3: Ice Retaining Structure Upstream of Reach 3, Basinwide Floodplain Management and Flood Insurance (Proposed Plan)

*Updated to October 1973 price levels based upon October 1972 level of development.

**Gives October 1974 prices and interest rate of 5-7/8 percent, this ratio becomes 0.98

Table D-9

Detailed Estimate of First Costs for the Recommended Ice Retaining Structure

Item	Quantity	Unit	Unit Cost(1)	Estimated First Cost(2)		
				Federal	Non-Federal	Total
Land	95	Acre	$2,200.00		$209,000	$209,000
Clearing	15	Acre	750.00	$ 11,300		11,300
Beautification following Construction		L.S.		31,000		31,000
Dewatering and Access		L.S.		86,000		86,000
Excavation Common	10,600	C.Y.	1.87	19,800		19,800
Rock	1,050	C.Y.	15.50	16,300		16,300
Waterproof Manholes	29		450.00	13,000		13,000
Drainage Culvert and Control Gate		L.S.		7,500		7,500
Ice Boom		L.S.		81,400		81,400
Non-reinforced Concrete	4,900	C.Y.	65.60	321,000		321,000
Reinforced Concrete	125	C.Y.	163,00	20,400		20,400
Contingencies				121,500	31,400	152,900

Table D-9 (Cont'd)

Detailed Estimate of First Costs for the Recommended Ice Retaining Structure

Item	Quantity	Unit	Unit Cost(1)	Estimated First Cost(2)		
				Federal	Non-Federal	Total
Total Construction Cost				$729,200	$240,400	$ 969,600
Engineering and Design (13%)				94,800		94,800
Supervision and Administration (10%)				72,900		72,900
Total First Cost				$896,900	$240,400	$1,137,300
Rounded First Cost				$897,000	$240,000	$1,137,000

(1) October 1974 price levels

(2) Costs are rounded to the nearest one hundred dollars

Note: Contingencies are assumed to be 15 percent for lands and 20 percent for all other items

D.10 BENEFITS

D.11 Existing Flood Damages

D.12 The Corps of Engineers completed a damage survey for the January 1959 flood event during 1960. This survey covered Cazenovia Creek from the Buffalo River to Mill Road. A damage survey was also conducted after the March 1972 flood in the West Willowdale Drive area and the Southgate Plaza area in Subreaches 3B and 3C. An inventory of all structures in the floodplain from Ridge Road upstream to Mill Road was made in April 1972. During September and October 1972, a similar inventory was made covering the reach from the Buffalo River to Ridge Road. The various structures were classified into residential, commercial, and public and other categories; and first-floor elevations were established for all structures and streets in the various reaches. This inventory also determined the number of existing structures in each category which would be affected by the 100-year discharge under ice-affected conditions. The number of structures that would experience first-floor flooding under these conditions was also recorded.

D.13 Flood losses or damages in the floodplain along Cazenovia Creek were designated by classes and types of damages. Tangible damages were considered to be physical damage caused by inundation, flood emergency losses or costs incurred in fighting or preparing for flooding, and business or other financial losses resulting from decreased production, loss of profit and wages, and increased cost of normal operations and living. Damages were determined for three categories: residential, commercial, and public and other. Nonrecurring flood damages, such as the destruction of a building that is not replaced, were not included in the flood damage compilation.

D.14 The lower basin was divided into three flood damage reaches, each of which was subdivided further into subreaches (see Table 32 and Plate 2). The Tannery Brook floodplain was also divided into reaches as shown on Plate 24. These reaches have been established by geographic and land-use features whenever possible to facilitate economic analyses of separable areas subject to flooding.

D.15 Flood damages for the reaches and subreaches in the lower Cazenovia Creek Basin were evaluated for the 1972 level of development. Plate 27 presents the stage-damage curves for each Cazenovia Creek subreach based on January 1973 price levels. The price levels were updated to October 1974 for the detailed economic analysis of the selected plan. Stage-damage curves for Tannery Brook are shown on Plate 28. The average annual damages presented in Table C-11 were determined for each reach using the stage-frequency curves on Plates 21 and 25 and the stage-damage curves presented on Plates 27 and 28.

Table D-10

Annual Costs for the Recommended Ice Retention Structure

Item	Annual Costs (1)		
	Federal	Non-Federal	Total
Rounded First Cost	$897,000	$240,000	$1,137,000
Annual Charges			
Interest (5-7/8%) and Amortization (100-year economic life)	52,900	14,100	67,000
Maintenance	900	10,500	11,400
Total Annual Costs	$ 53,800	$ 24,600	$ 78,400
Rounded Annual Costs	$ 54,000	$ 25,000	$ 78,000

(1)October 1974 price levels

D.16 The anticipated increase in flood damages due to future growth was not considered to be significant based on the land use master plan presented in Plate 18 and on expected floodplain management regulations. Reach 1 is already extensively developed in the area near the Buffalo River, while Cazenovia Park will continue to remain undeveloped. In Reach 2, residential and commercial development does exist, but future encroachment into undeveloped floodplain areas could be controlled by floodplain management regulations. Reach 3 is developed except for the tract of land between Parkside Drive and Ridge Road. Development of this tract should be regulated to prevent floodway construction and construction of floodprone improvements in the flood fringe area. Upstream of Mill Road, beyond the ice retaining structure, the creek generally flows in a gorge and significant flood damagable developments neither exists nor are probable with proper floodplain management. The areas along Tannery Brook are extensively developed, but future developments should be required to be floodproofed.

D.17 Benefit Analysis

D.18 The primary effect of the ice retaining structure on flood conditions is to reduce ice-affected stages. The monetary benefits derived as a result of the stage reduction is the difference between average annual damages under existing ice-affected flow conditions and the average annual damages to be expected with free flow conditions. Flood damages for existing conditions are shown in Table D-11. The average annual damages under free flow conditions in Table D-12 were determined using the stage-frequency curves on Plate 21 for free flow

Table D-11

Existing Average Annual Flood Damages

Damage Area	Average Annual Damages(1)
Subreach 1A	\$ 72,100(2)
Subreach 1B	10,400
Subreach 2A	13,400
Subreach 2B	1,800
Subreach 3A	100
Subreach 3B	104,300
Subreach 3C	10,100
Tannery Brook	16,500
Total	\$228,700

(1) October 1974 price levels; for development existing in mid-1972.

(2) This amount includes the amount allocated annually by the City of Buffalo for the use of amphibious vehicles.

Table D-12

Remaining Average Annual Damages After Construction of the Ice Retaining Structure

Damage Area	Average Annual Damages(1)
Subreach 1A	\$54,800[2]
Subreach 1B	1,400
Subreach 2A	400
Subreach 2B	1,700
Subreach 3A	100
Subreach 3B	100
Subreach 3C	300
Tannery Brook	16,500
Total	\$75,300

(1) October 1974 price levels; for development existing in mid-1972.

(2) Damage reduction from discontinuance of ice patrols.

conditions and the stage-damage curve presented on Plate 27. The total average annual benefits due to flood damage reduction ($153,400) is equal to the existing average annual flood damages in Table D-11 less the remaining average annual damages in Table D-12.

D.19 In addition to benefits attributable to existing development, benefits due to economic growth must also be considered. The economic growth factor is used to estimate future flood damages to existing development due to economic growth. Per capita income of residents in the Cazenovia Creek floodplain will increase during the 100-year economic life of the project. Part of this per capita income increase will be used to make improvements to existing structures and contents. Future damages must, therefore, be adjusted to account for the added value of these improvements during the project life.

D.20 The factor used to incorporate future economic growth has been based on the projected growth, over the project life, of constant dollar per capita income as published by OBERS*. OBERS' baseline projections provide the most reliable set of data available for the evaluation of economic impact of development programs and projects. These baseline projections are available only on a decadal basis from 1980 to 2020, however, and are not available for a 100-year period. Projections are not normally developed beyond a 50-year period because uncertainties make such projections unreliable. The growth factor based on OBERS' 50 years of projected and historical data was considered to be the best estimate of economic growth for the considered project life. Per capita income was projected to increase from $3,531 in 1969 to $13,700 in 2020.

D.21 Only part of the $11,040 per capita income increase would be related to real property expenditures since the increase is also consumed in the form of food, recreation, transportation, medical care, and other services. The distribution of personal consumption expenditures (PCE) has been used to determine the percentage of per capita income spent on real property. The percentage distribution of PCE was obtained from the Statistical Abstract of the United States. PCE on real property has historically been about forty percent of the total. Therefore, only forty percent of the per capita income increases was assumed to be spent for improvements to existing floodplain properties and thus results in the increases in future flood damages. Forty percent of the per capita increase has been multiplied by the 5-7/8 percent compounded growth factor, 0.24**, for the 50-year period for which per capita income was projected. The compounded growth factor was used since a graphical representation of the projected per capita income values most closely represented a compounded growth curve. The resulting value from the calculation, $1,060, was divided by $3,433 to determine the percent increase. The 31-percent increase, multiplied by the existing average annual benefits, represents the increase in average annual benefits due to future economic growth to existing development. Although the economic growth factor results in an increase in the B/C ratio over the project life, it was not used during the plan selection process.

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*Obers Projections. Volume 2, BEA Economic Areas. U. S. Water Resources Council, Washington, DC

**The compound growth factor .24 discounts future values to present worth.

D.22 In addition to benefits from the reduction in flood damages to existing developments as discussed earlier, other less quantifiable benefits can be attributed to construction of the ice retaining structure. These would include: possible land enhancement to undeveloped areas in Subreaches 2B and 3A as a result of reduction in maximum flood stages, increased opportunities for parkland development, a more aesthetically pleasing flood management measure than floodwalls or levees, and possible reduction in downstream sedimentation problems.

D.23 Economic Justification

D.24 A summary of the results of the economic analysis for the selected plan for flood protection for Cazenovia Creek and Tannery Brook is shown in Table D-13. The recommended ice retaining structure would result in total annual benefits of $153,400 at an average annual cost of $78,400 giving a benefit/cost ratio of 1.96 without consideration of future economic growth and other factors discussed above.

D.25 Cost Apportionment

D.26 Apportionment of cost for the recommended ice retaining structure between Federal and non-Federal interests is based on existing Federal legislation and administrative policies governing flood control. In this regard, all costs associated with construction of levees, floodwalls, interior drainage structures, bank protection, and aesthetic treatment are assigned to the Federal Government. Local interests would provide all lands, easements, and rights-of-way; pay all grade change damages; and make necessary relocations and/or modifications of utilities. Operation and maintenance costs are shared, with the Federal Government assuming responsibility for sediment removal on the basis that sediment trapped by the ice retention structure would eventually have been dredged from the Buffalo harbor at Federal expense.

D.27 The distribution of first costs, including appropriate engineering design, supervision, and administration costs, is shown in Table D-14. The estimated annual charges, based on a 5-7/8 percent interest rate and a 100-year project life, are shown in Table D-15.

Table D-13

Summary of Benefit/Cost Analysis of the Selected Plan(1)

	$
Rounded annual benefits	153,400
Rounded annual costs	78,400
Net annual benefits	75,000
Benefit/cost ratio	1.96
Remaining annual damages (exclusive of Reach 1A and Tannery Brook)	4,000
Remaining annual damages in subreach 1A	54,800
Remaining annual damages in Tannery Brook	16,500
Total remaining annual damages in Cazenovia Creek Basin	75,300

(1) Based on October 1974 price levels and mid-summer 1972 level of development; includes allowance for discontinuance of ice breaking activities by the City of Buffalo.

Table D-14

Apportionment of Project Costs

Item	Federal	Non-Federal	Total
Lands		$209,000	$ 209,000
Clearing	$ 11,300		11,300
Dewatering and Access	86,000		86,000
Ice Retention Structure	397,700		397,700
Ice Boom	81,400		81,400
Beautification Following Construction	31,000		31,000
Contingencies, Engineering Supervision and Admin-	289,200	31,400	320,600
Total	$896,600	$240,400	$1,137,000
Rounded Total	$897,000	$240,000	$1,137,000

Table D-15

Annual Charges

Item	Federal	Non-Federal	Total
First Costs	$897,000	$240,000	$1,137,000
Interest and Amortization	52,900	14,100	67,000
Maintenance	900	10,500	11,400
Total Annual Charges	$ 53,800	$ 24,600	$ 78,400
ROUNDED CHARGES	$ 54,000	$ 26,000	$ 79,000

APPENDIX E

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STATEMENT OF FINDINGS

STATEMENT OF FINDINGS

Buffalo Metropolitan Area, NY
Water Resources Management
Interim Report on Feasibility of
Flood Management in Cazenovia Creek Watershed

I have reviewed and evaluated, in light of the total public interest, the reports of other studies, and other documents compiling data concerning the proposed action in the Cazenovia Creek watershed, Erie County, NY. Similarly, I have also reviewed and evaluated the views of other agencies and the public, relative to various plans of improvement. I have studied and analyzed the possible consequences of these plans, considering engineering feasibility, environmental effects, economic feasibility and social well-being. I have also considered means of eliminating or minimizing possible adverse environmental, social, and economic effects, in accordance with Section 122, P.L. 91-611.

Background

The purpose of this study was to identify flood management needs in the Cazenovia Creek Watershed and to develop alternative plans to provide for them. The study was undertaken in response to a resolution of the Committee on Public Works of the House of Representatives adopted 13 June 1956; resolution of the Committee on Public Works of the United States Senate, adopted 10 July 1961; and resolution of the House Committee on Public Works adopted on 14 June 1972.

Flooding is the paramount water-related problem in the Cazenovia Creek watershed. Damaging flooding along Cazenovia Creek generally occurs during late winter and early spring when major runoff events from snowmelt and rainfall on frozen ground frequently combine with ice jamming. Local flooding, particularly in the lower developed portion of the basin, is often aggravated by ice jams that cause higher than normal stages. Discharges that would be non-damaging under ice-free conditions have resulted in severe flood damages when ice jams temporarily dam them. Flooding has occurred in February and March 1904, January 1929, June 1937, March 1942, March 1955, March 1956, January 1959, January 1962, March 1964, February 1965, December 1969, January 1970, and March 1972. The maximum discharge on record, 13,500 cfs, occurred during the flood of March 1955. Both tangible and intangible damages and losses are experienced during flooding along Cazenovia Creek. Tangible damages and/or losses include: physical damage to flooded structures, utilities and transportation facilities; flood-fighting costs; cleanup costs; business losses; and, increased operating and living costs during a flood. Intangible losses include the social, psychological and health problems that are associated with flooding.

During the study, coordination was maintained with various Federal, State, and local agencies and Governmental entities, including the U. S. Department of Housing and Urban Development, the National Park Service, the U. S. Fish and Wildlife Service, the U. S. Environmental Protection Agency, the U. S. Soil Conservation Service, the Erie and Niagara Counties Regional Planning Board, the NYS Department of Environmental Conservation, the City of Buffalo, the Town of West Seneca, the Village of East Aurora, the Town of Elma and the Town of Aurora. Inputs to the study from the general public were obtained through public meetings and numerous discussions with individuals and organizations in the area. Formal public meetings were held on 11 December 1973, 21 June 1974 and 26 November 1974. Meetings with individuals and local interest groups were held on 22 August, 28 August, and 13 September 1974, and on 8 March 1974. A workshop was held on 7 December 1973.

Selected Plan

The proposed plan provides for construction of an ice retention structure in the Town of West Seneca, NY floodplain. The purpose of the ice retention structure is to retain ice formed in the headwaters of Cazenovia Creek. The primary effect of retaining ice formed in the headwaters would be to reduce ice jamming and attendant flooding downstream from the ice retention structure. The structure would include a short-height reinforced concrete dam, a stilling pool and a floating boom. The dam, comprising a two-stage weir, would extend across the Cazenovia Creek floodplain at a site approximately 2,000 feet upstream of Mill Road. It would be about 900 feet long and its low stage weir would extend 250 feet from the high south bank of the creek channel, across the channel, and into the present floodplain. The dam would include three drain conduits to permit draining the stilling pool for that period of the year that the ice retention function is not needed. Normally, the stilling pool would lie nearly totally within the existing creek channel and would have a maximum depth of approximately 10 feet and a surface area of about 11 acres. The high-stage weir would extend from the low-stage weir the remaining distance across the floodplain to the north side of the valley. This part of the dam would stand approximately eight feet above the surface of the floodplain near the creek. A floating boom would extend from an anchor on the left (south) abutment across the mouth of the low-stage weir (the principal spillway) to an anchor on the dam. Floodplain management and participation in the National Flood Insurance Program are recommended throughout the entire Cazenovia Creek Watershed.

Alternatives

Thirteen other alternatives were considered:

No Action - This alternative means that no Corps action would be taken to solve flooding problems in the Cazenovia Creek Basin. Therefore, damages and losses due to flooding would continue to occur at present rates.

Local Protection in Reach 3 and Floodplain Management - This alternative provides for a levee-floodwall measure. Based on October 1973 prices and an amortization interest rate of 5-5/8 percent, this plan was found to be barely viable economically with a benefit/cost ratio of 1.02. However, based on October 1974 prices and a then prevailing interest rate of 5-7/8 percent, this alternative is no longer viable with a benefit/cost ratio of 0.98. With higher present prices and an interest rate of 6-7/8 percent, this alternative cannot be economically justified.

Floodproofing in Reach 3 and Floodplain Management - This alternative requires floodproofing in Subreach 3B and would entail modifying existing buildings to reduce flood damages. Floodplain management would also be a part of this plan. This alternative does not completely satisfy the project objectives since it would not address the disruption and inconvenience caused by flooding (e.g. disruption of traffic and public services). Further, this alternative offers a lower benefit/cost ratio than the proposed plan (1.39 versus 2.06) and lower net benefits ($25,700 versus $72,700).

Diversion Channel Tannery Brook - This alternative provides for diversion of floodwaters from Tannery Brook to a tributary of Buffalo Creek. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.47.

Flood Retention Reservoir Site 1 - This alternative provides for construction of a reservoir on Cazenovia Creek approximately two miles upstream of Springbrook, NY. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.20.

Flood Retention Reservoir Site 2 - This alternative provides for construction of a reservoir on Cazenovia Creek approximately one mile upstream of Springbrook, NY. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.21.

Levee and Floodwall Reach 1 - This alternative provides for construction of levee and floodwall measures in Reach 1. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.51.

Levee and Floodwall Reach 2 - This alternative provides for construction of levee and floodwall measures in Reach 2. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.29.

Levee and Floodwall Reach 3, Alignment B - This alternative provides for a levee to extend from high ground near Seneca Street, southward along the west side of Parkside Drive to the north bank of the creek's channel, then eastward along this bank to high ground at the Southgate Shopping Plaza. From the upstream end of the levee, a three foot high sheet pile floodwall would extend to Union Road. Upstream of Union Road a levee would be constructed along the right bank to a point upstream of Mill Road, and then across the floodplain to meet high ground near Seneca Street. Riprap bank protection would be provided as required along this section. The creek channel along West Willowdale Drive near Parkside Drive would be relocated and its bank protected with riprap. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.53.

Levee and Floodwall Reach 3, Alignment C - This alternative provides for a levee-floodwall measure to enclose the entire right side floodplain from just upstream of the Mill Road Bridge to the Ridge Road Bridge. The measure would be similar to the Alignment B measure from Parkside Drive upstream. Downstream from Parkside Drive, the levee would extend along the right bank of the creek channel to high ground adjacent to the Ridge Road Bridge. This alignment would encroach into the floodway to decrease the flow area significantly. The decrease would be compensated for by enlarging the channel between the Ridge Road and Union Road Bridges. The alternative was rejected as economically unjustifiable with a benefit/cos ratio of 0.39.

Floodproofing Reach 1 - This alternative provides for modification of buildings in Reach 1 to reduce flood damages. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.15.

Floodproofing Reach 2 - This alternative provides for modification of buildings in Reach 2 to reduce flood damages. However, the alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.65.

Floodproofing Along Tannery Brook - This alternative provides for modifications of buildings in the floodplain along Tannery Brook. However, the alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.54.

Evaluation

In evaluating the selected plan, the following points were considered pertinent:

Environmental Considerations

Construction of the ice-retention structure would necessitate removal of existing vegetation from the proposed dam location and five acre stilling pool site. Even though Cazenovia Creek is generally shallow and much of the creek bottom is bedrock, some disruption to aquatic life and potential fish spawning areas would be unavoidable. The impact on existing aesthetic features of the environmental setting due to the project would be mitigated to some degree by grading and planting disturbed soil areas. In addition, the Contractor would be required to abide by contract specifications for protection of the environment as outlined in "Civil Works Construction Guide Specifications for Environment Protection," CE 1300, dated June 1973.

Social Well-Being Considerations

Protection provided by implementation of the proposed project would improve the social well-being of community residents in Reaches 1 through 3 by reducing the potential threat of flooding. The frequency and duration of overbank flooding would decrease and flood protection would be provided for approximately 697 residences and 64 businesses. Alleviation of flooding frequency would reduce the threat to traffic and emergency services, physical injury and property damage and public health and safety.

Engineering Considerations

The ice retention structure provides protection of various degrees for all properties in the floodplain downstream. It provides protection in the major damage area against the 125-year frequency flood. Engineering considerations dealt with the function of the considered structure and practicability of its construction. In development of the proposed plan, consideration was given to alternative features for improvement. The plan is considered to reflect properly the minimum scope of improvement needed to obtain the desired degree of protection.

Economic Considerations

Economic considerations resulted in selecting a plan that would economically reduce flood damages to residential, public and commercial developments in the Cazenovia Creek watershed. Based on 1974 prices, the estimated total first cost of the selected plan is $1,137,000. Total average annual benefit would be $153,400 and total average annual cost would be $78,400. Accordingly, the benefit/cost ratio of the selected plan is approximately 2.0/1.0.

Conclusion

I find that the action proposed is based on thorough analysis and evaluation of various practicable alternative courses of action for achieving the stated objectives. Wherever adverse effects are found to be involved, they cannot be avoided by following reasonable alternative courses of action which would achieve the purposes specified by the Congress. Where the proposed action has an adverse effect, this effect is either ameliorated or substantially outweighed by other considerations of national policy. In light of these findings, I am convinced that the action as proposed is fully consistent with national policy, laws, and administrative directives. Accordingly, it is my decision that the total public interest would best be served by the implementation of the recommendation.

Bernard C Hughes

Date: 25 March 1975

BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

I concur with the preceding Statement of findings.

W O Bachus

26 April 1975
(Date)

W. O. BACHUS
Brigadier General, USA
Division Engineer

I concur with the preceding Statement of findings

Drake Wilson

17 July 1977
Date

DRAKE WILSON
Brigadier General, USA
Deputy Director of Civil Works

96th Congress, 1st Session - - - - - - - House Document No. 96-127

AMENDMENTS TO REORGANIZATION PLAN NO. 2 OF 1979

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

AMENDMENTS TO REORGANIZATION PLAN NO. 2 OF 1979,
PURSUANT TO 5 U.S.C. 903

May 21, 1979.—Message and accompanying papers referred to the Committee on Government Operations, and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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To the Congress of the United States:

I herewith transmit amendments to Reorganization Plan No. 2 of 1979, which I transmitted to the Congress on April 10, 1979. Except as specifically amended hereby, Reorganization Plan No. 2 remains unmodified.

JIMMY CARTER.

THE WHITE HOUSE, *May 21, 1979.*

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AMENDMENTS TO REORGANIZATION PLAN NO. 2 OF 1979

Prepared by the President and transmitted to the Senate and the House of Representatives in Congress assembled May 21, 1979, pursuant to the provisions of chapter 9 of title 5 of the United States Code.

Reorganization Plan No. 2 of 1979, which was transmitted to the Senate and the House of Representatives in Congress assembled on April 10, 1979, is hereby amended as follows:

A. Section 2 is amended to read:

"Section 2. *Director*

"The Agency shall be headed by the Director of the United States International Development Cooperation Agency (hereinafter referred to as the 'Director'), who shall be appointed by the President, by and with the advice and consent of the Senate, and shall receive compensation at the rate prescribed by law for Level II of the Executive Schedule. The Director shall have primary responsibility for establishing overall development assistance policy and coordinating international development activities supported by the United States. The Director shall serve as the principal advisor to the President and the Secretary of State on international development matters and also shall advise the President on all trade, science and technology, and other matters significantly affecting the developing nations. The Director shall report to the President and, on matters relating to foreign policy, to the Secretary of State. The Director shall designate the order in which other officials shall act for and exercise the powers of the Director during the absence or disability of the Director and the Deputy Director or in the event of vacancies in both such offices.".

B. Section 5 is amended to read:

"Section 5. *Performance of functions*

"The Director may from time to time establish, alter, consolidate, or discontinue organizational units within the Agency (other than units expressly established by statute or reorganization plan). The Director may from time to time delegate responsibility for carrying out any function or authority of the Director of the Agency to any officer, employee, or unit of the Agency, or any other officer or agency of the executive branch.".

C. Section 6 is amended to read:

"Section 6. *Transfers of functions*

"(a) There are hereby transferred to the Director all functions and authorities vested in the Agency for International Development or in its administrator pursuant to the following:

"(1) sections 233(b), 239(i), 296(e), 297(d), 298(c)(6), 299(d), 601 (a) through (d), and 624(f)(2)(C) of the Foreign Assistance

Act of 1961, as amended (22 U.S.C. 2193(b), 2199(i), 2220a(e), 2220b(d), 2220c(c)(6), 2220d(d), 2351 (a) through (d), and 2384(f)(2)(C));

"(2) section 407 of the Agricultural Trade Development and Assistance Act of 1954, as amended (7 U.S.C. 1736a); and

"(3) section 706 of the Foreign Relations Authorization Act, Fiscal Year 1979 (49 U.S.C. 1518).

"(b) There are hereby transferred to the Director all functions and authorities vested in the agency primarily responsible for administering part I of the Foreign Assistance Act of 1961, as amended, or in its Administrator pursuant to the following:

"(1) sections 101(b), 119, 125, 531(a)(2), 601(e)(2), and 640B of such Act (22 U.S.C. 2151(b), 2151q, 2151w, 2346(a)(2), 2351(e)(2), and 2399c); and

"(2) section 602 of the International Security Assistance and Arms Control Act of 1976 (22 U.S.C. 2352 note).

"(c) There are hereby transferred to the Director all functions and authorities vested in the Secretary of State pursuant to the following:

"(1) section 101(b) of the Foreign Assistance Act of 1961, as amended (22 U.S.C. 2151(b)), insofar as it relates to policy guidance other than foreign policy guidance, and section 622(c) of such Act (22 U.S.C. 2382(c)), insofar as it relates to development assistance; and

"(2) section 901 of Public Law 95-118 (22 U.S.C. 262g).".

96th Congress, 1st Session - - - - - - - House Document No. 96-128

SUPPLEMENTAL APPROPRIATIONS

COMMUNICATION

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

A REQUEST FOR SUPPLEMENTAL APPROPRIATIONS FOR FISCAL YEAR 1979 FOR THE SMALL BUSINESS ADMINISTRATION

May 21, 1979.—Referred to the Committee on Appropriations, and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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THE WHITE HOUSE,
Washington, D.C., May 18, 1979.

The Speaker of the House of Representatives;

SIR: I ask the Congress to consider a request for supplemental appropriations for the fiscal year 1979 in the amount of $400,000,000 for the Small Business Administration.

The details of this proposal are set forth in the enclosed letter from the Director of the Office of Management and Budget. I concur with his comments and observations.

Respectfully,

JIMMY CARTER.

Enclosure.

[Estimate No. 14; 96th Congress, 1st sess.]

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF MANAGEMENT AND BUDGET,
Washington, D.C., May 18, 1979.

The PRESIDENT,
The White House.

SIR: I have the honor to submit for your consideration a request for supplemental appropriations for the fiscal year 1979 in the amount of $400,000,000 for the Small Business Administration. The details of this request are contained in the enclosure to this letter.

I have carefully reviewed the request for appropriations contained in this document and am satisfied that it is necessary at this time. I recommend, therefore, that this request be transmitted to the Congress.

Respectfully,

JAMES T. MCINTYRE, JR.,
Director.

Enclosure.

OTHER INDEPENDENT AGENCIES

SMALL BUSINESS ADMINISTRATION

SALARIES AND EXPENSES

For an additional amount for "Salaries and expenses", $2,000,000.

Heading	1979 supplemental request H. Doc. No. 96-66	1979 supplemental request	1979 revised request
Disaster loan fund	$620,000,000	$398,000,000	$1,018,000,000

This request would provide the funds necessary to assist the victims of tornado damage in Texas, Arkansas, and Oklahoma and of severe flooding in Mississippi, Alabama, Louisiana, Missouri, Minnesota, and North Dakota. This proposal would increase 1979 outlays by $280 million and 1980 outlays by $120 million.

96th Congress, 1st Session - - - - - - - - - House Document No. 96-129

FINANCIAL REFORM LEGISLATION

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

HIS RECOMMENDATIONS FOR COMPREHENSIVE FINANCIAL
REFORM LEGISLATION

MAY 22, 1979.—Message referred to the Committee on Banking, Finance and Urban Affairs, and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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To the Congress of the United States:

For over a decade, the Federal government has limited the interest rates that savers can receive on their deposits in banks and savings institutions. In keeping with my commitment to eliminate inequitable and unnecessary regulations, I directed an Administration task force, chaired by the Treasury Department, to review the fairness, effectiveness and efficiency of these interest rate controls.

Based on the task force's findings, I am today recommending that the Congress enact comprehensive financial reform legislation. I am asking that the Congress permit an orderly transition to a system where the average depositor can receive market-level interest rates on his or her savings. I am also proposing measures to protect the long-term viability of savings institutions so that they can pay fair and competitive rates to depositors and continue their traditional role in meeting our nation's housing needs.

These actions will reform a system which has become increasingly unfair to the small saver. The present rate ceilings are costing the American people billions of dollars in lost interest annually. Our senior citizens, and others whose savings are concentrated in passbook accounts, have suffered the most. During a period of high inflation, it is particularly unconscionable for the Federal government to prohibit small savers from receiving the return on their deposits that is available to large and sophisticated investors.

The present ceilings have also contributed to sharp fluctuations in the flow of housing credit. Large cyclical swings in the availability of mortgage funds have increased housing costs and forced many prospective homebuyers out of the market during periods of high interest rates. The actions I am recommending today will help assure a steadier flow of mortgage credit for homebuyers.

Savings and loan associations exist to channel household savings into mortgages. Mutual savings banks are also major suppliers of housing credit. Because these institutions invest in long-term, fixed-rate mortgages, they are limited in their ability to meet competitive rates for savings when interest rates rise.

In 1966, interest rates rose sharply, and depositors fled many of these institutions to those able to pay higher interest rates. To prevent the failure of savings institutions and the disruption of the mortgage and housing markets, deposite rate ceilings covering commercial banks were temporarily extended to thrift institutions. The ceilings generally have been administered to permit thrift institutions to pay higher rates of interest than commercial banks.

Conditions have changed dramatically since these limitations were first imposed on thrift institutions. In the current economic and financial environment, the ceilings have the following effects:

> They discriminate against the small saver, who often lacks insufficient funds to purchase market-rate securities which are available to the large investor.

They are increasingly ineffective in maintaining deposit flows to thrift institutions. The financial marketplace is becoming adept at creating new investment alternatives, such as the money market mutual funds, which induce the small saver to withdraw his funds to obtain benefits similar to those enjoyed by the large investor. While the six-month money market certificate has succeeded in maintaining the flow of housing credit since last year, it has imposed serious pressures on thrift institutions, and it is not a long-term solution.

They avoid the discipline of competition and create inefficiencies in the financial marketplace. Financial institutions are limited to non-price competitive practices such as merchandising gifts, although the consumer might prefer a higher yield on his savings.

These problems cannot be solved overnight. They are rooted in the structure of our financial system, and their resolution will require a careful and deliberate approach which takes account of the realities facing our thrift institutions.

Our savings institutions have been required by law and influenced by tax incentives to invest primarily in residential mortgages. In most States, the law confines them to long-term fixed-rate mortgages. Their sources of funds—deposits—have considerably shorter maturities. When short-term interest rates rise sharply, revenues are limited by their earnings on the existing longer-term mortgages. Since their deposit liabilities are more volatile than their assets, they must pay depositors market rates or they start to lose their deposits.

While raising or removing the ceilings would give savings institutions the legal power to pay market rates to depositors, their economic ability to do so is still limited by the earnings from their mortgage investments. Savings institutions must be given new investment powers so that they can afford to pay higher rates and maintain the flow of mortgage credit. The transition to freer deposit rates and to new asset powers must be orderly, to avoid major shocks to the financial system.

The disparity between market rates and the ceilings is greatest during periods of high interest rates. Yet that is the time when it is most difficult for the regulatory agencies that set ceilings to raise them substantially. These agencies are also responsible for the safety and soundness of financial institutions. If deposit interest rates rise sharply, the institutions' earnings come under great pressure unless, at the same time, their earnings are made more responsive to changing interest rates.

Accordingly, I shall ask the Congress to:

Provide that through an orderly transition period all deposit interest rates be permitted to rise to market-rate levels. This will be subject to emergency action on the part of the responsible regulators if the safety and soundness of financial institutions is threatened or the implementation of monetary policy so requires;

Grant the power to offer variable rate mortgages to all Federally-chartered savings institutions, subject to appropriate consumer safeguards. This authority, which would be phased in, would permit thrifts the earnings flexibility to pay competitive rates throughout the business cycle;

Permit all Federally-chartered savings institutions to invest up to 10 percent of their assets on consumer loans; and

Permit all Federally-insured institutions to offer interest-bearing transaction accounts to individuals.

These steps will bring the benefits of market rates to consumers, promote a steadier flow of mortgage credit and improve the efficiency of the financial markets.

In the interim, I support the efforts of the Federal Reserve, the FDIC, the Federal Home Loan Bank Board and the National Credit Union Administration to take steps to increase the interest rates payable to small savers. I urge them to pursue the direction begun with authorization of the six-month money market certificate, with the goal of increasing the responsiveness of the interest rate ceilings to market rates.

JIMMY CARTER.

THE WHITE HOUSE, *May 22, 1979.*

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96th Congress, 1st Session - - - - - - - House Document No. 96–130

SUPPLEMENTAL APPROPRIATIONS AND BUDGET AMENDMENTS

COMMUNICATION

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

REQUESTS FOR SUPPLEMENTAL APPROPRIATIONS AND SUPPLEMENTAL APPROPRIATIONS LANGUAGE FOR FISCAL YEAR 1979, AND AMENDMENTS TO THE BUDGET FOR FISCAL YEAR 1980

MAY 22, 1979.—Referred to the Committee on Appropriations and ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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THE WHITE HOUSE,
Washington, D.C., May 21, 1979.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I ask the Congress to consider requests for supplemental appropriations in the amount of $17,234,000 and supplemental appropriations language for the fiscal year 1979, and amendments to the request for appropriations for the fiscal year 1980 in the amount of $359,695,000.

The details of these proposals are set forth in the enclosed letter from the Director of the Office of Management and Budget. I concur with his comments and observations.

Respectfully,

JIMMY CARTER.

Enclosures.

[Estimate No. 15: 96th Congress, 1st sess.]

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF MANAGEMENT AND BUDGET,
Washington, D.C., May 21, 1979.

THE PRESIDENT,
The White House.

SIR: I have the honor to submit for your consideration requests for supplemental appropriations in the amount of $17,234,000 and supplemental appropriations language for the fiscal year 1979, and amendments to the request for appropriations for the fiscal year 1980 in the amount of $359,695,000. The details of these requests are contained in the enclosure to this letter.

I have carefully reviewed the proposals contained in this document and am satisfied that these requests are necessary at this time. I recommend, therefore, that these proposals be transmitted to the Congress.

Respectfully,

JAMES T. MCINTYRE, Jr.,
Director.

Enclosures.

DEPARTMENT OF JUSTICE—LEGAL ACTIVITIES

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
620	Salaries and expenses, U.S. attorneys and marshals..	$234,632,000	−$3,652,000	$230,980,000

This request for a decrease in 1980 appropriations for the U.S. Marshals Service is related to recently transmitted legislation that would remove the private process serving function from U.S. marshals. It has been determined that other process servers can handle this function with greater efficiency, releasing U.S. marshals for more important work. This proposal was included in the 1980 budget as an item to be transmitted to the Congress at a later date. This proposal would not alter the budget estimate.

DEPARTMENT OF JUSTICE

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
631	Federal Prison System, National Institute of Corrections	$9,884,000	−$9,884,000	
637	Law Enforcement Assistance Administration, Salaries and expenses	170,853,000	−170,853,000	

These changes are part of the reorganizations and reforms which would be authorized by the proposed Justice System Improvement Act. The changes were planned for later transmittal in the January budget. The outlay estimates in the budget are not changed.

DEPARTMENT OF JUSTICE

Office of Justice Assistance

RESEARCH AND STATISTICS

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
637	Law Enforcement Assistance (Delete the title "Law Enforcement Assistance Administration" and all of the material thereunder and insert in lieu thereof the above heading and the following appropriation language:) *For grants, contracts, cooperative agreements, an other assistance authorized by the Justice System Improvement Act of 1979 and Title II of the Juvenile Justice and Delinquency Prevention Act of 1974, as amended, including salaries and other expenses in connection therewith, $497,936,000, to remain available until expended.*		$497,936,000	$497,936,000
637	Research and Statistics (Insert the above heading and the following appropriation language immediately following the material under the heading "Law Enforcement Assistance":) *For grants, cooperative agreements, contracts, and other assistance authorized by the Justice System Improvement Act of 1979, including salaries and other expenses in connection therewith, $48,411,000, to remain available until expended.*		48,411,000	48,411,000

These proposed budget amendments are a part of the reorganization and reauthorization of the Law Enforcement Assistance Administration that would be authorized by the proposed Justice System Improvement Act. This proposal was included in the 1980 budget as an item to be transmitted to the Congress separately, so 1980 outlay estimates will not be affected.

DEPARTMENT OF TRANSPORTATION

U.S. COAST GUARD

POLLUTION FUND

For carrying out the provisions of subsections (c), (d), (i), and (l) of section 311 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1321, $23,000,000 to remain available until expended.

This request for a supplemental appropriation is required to provide funds to replenish the Pollution Fund. These funds will assure expeditious cleanup of oil or hazardous substances spilled into the Nation's waters. This proposal will increase 1979 outlays by $3 million.

VETERANS' ADMINISTRATION

1980 budget appendix page	Heading	1979 supplemental request pending	1979 proposed amendment	1979 revised request
1,116	General operating expenses	$7,257,000	−$4,166,000	$3,091,000
1,116	Grants to the Philippines	1,700,000	−1,200,000	500,000

These revised requests reflect a later than originally expected enactment date of the supplemental appropriation. These proposals would reduce 1979 outlays by $5.4 million.

OTHER INDEPENDENT AGENCIES—CIVIL AERONAUTICS BOARD

1980 budget appendix page	Heading	1979 request pending	1979 proposed amendment	1979 revised request
1,131	Salaries and expenses	$1,094,000	−$400,000	$694,000
871	Salaries and expenses	30,700,000	−2,263,000	28,437,000

These amended budget requests reflect a reduction in the estimated cost of Civil Aeronautics Board salaries and expenses for 1979 and 1980. The reduction is due to a faster than anticipated pace of deregulation under the Airline Deregulation Act of 1978. These proposals would reduce 1979 outlays by $400 thousand and 1980 outlays by $2.3 million.

OTHER INDEPENDENT AGENCIES

NATIONAL COMMISSION ON AIR QUALITY

SALARIES AND EXPENSES

Of the amount made available under this heading in the Department of Housing and Urban Development—Independent Agencies Act, 1979, $45,000 is available for expenses of necessary travel.

This appropriation language corrects a technical oversight that prohibits the Commission from spending any of its 1979 appropriation for necessary travel. This proposal would not affect outlays.

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96th Congress, 1st Session - - - - - - - - - House Document No. 96–131

WELFARE REFORM

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

HIS RECOMMENDATIONS FOR WELFARE REFORM

May 23, 1979.—Message referred to the Committees on Ways and Means, Education and Labor, and Agriculture and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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To the Congress of the United States:

I am submitting today my Welfare Reform program in two bills: the Social Welfare Reform Amendments of 1979 and the Work and Training Opportunities Act of 1979. Enactment of these proposals will be an important step in addressing the key failings of the present welfare system—promoting efficiency, improving incentives and opportunities to work, and substantially improving the incomes of millions of poor people.

For too many years, we have lived with a welfare system universally recognized to be inadequate and ineffective. It is a crazy-quilt patchwork system stitched together over decades without direction or design. It should offer opportunity, but often breeds dependency. It should encourage and reward useful work, but often penalizes those who find jobs.

The guiding principles of my proposals are simple: those who can work should; and there should be adequate support for those who cannot.

The legislation I am submitting today will:

—redirect our welfare system towards employment wherever possible, and provide training and jobs to break the cycle of poverty;

—help secure stable employment with an adequate income for millions of low-income families;

—save hundreds of millions of dollars each year by reducing waste, fraud, and error through tightened and streamlined administration;

—remove major inequities in the present welfare system and redirect assistance to those most in need and least able to help themselves.

In my campaign I pledged to work for welfare reform. The need for reform is no less serious now. I urge Congress to act promptly on this critically important social legislation. The need for action is clear:

The present system is both inadequate and unacceptably unfair.—Despite major efforts at all levels of government in the last twenty years, millions of American families throughout the U.S. still live in poverty. Moreover, under the present system assistance to needy households varies widely from state to state. Welfare benefits, including both food stamps and cash assistance, range from 49 percent to 96 percent of the poverty level. For example, current combined benefits in Mississippi for a family of four are $3,540 per year, while a poor family in Vermont receives $6,540. Twenty-four states have chosen not to provide Federally-supported cash benefits to two-parent families, while twenty-six do provide such assistance.

Many technical provisions of current law are inequitable or unnecessarily restrictive. For example:

—In those states which have adopted two-parent coverage, the family suddenly loses all benefits when the family breadwinner begins to work more than 100 hours a month. For a minimum wage earner that is only $290 per month. Yet a higher wage earner can earn more in 100 hours while retaining welfare benefits.

—A family which has been receiving public assistance and then starts to work, can continue receiving assistance even though their earnings may be higher than those of low-income families who are working but have never been on public assistance.

The present system is cumbersome and needlessly difficult to administer.—For example:

—Recipients who work are required to submit detailed lists of work-related expenses—which must then be used to calculate benefits. This is burdensome to the recipient and the system, and invites errors and fraud.

—The basic Federal welfare program and the food stamp program currently have different definitions of income and assets, although the same state offices usually administer both programs, and although welfare recipients are almost always eligible for food stamps as well.

This new legislation makes a number of important program simplifications and adopts measures to reduce error and abuse. Savings from reduced errors in the first full year of implementation will be about $300 million. This is in addition to the Administration's present efforts in child support enforcement and error reduction, which will yield savings of over $800 million in the coming year.

The present system provides insufficient opportunities for families to move off cash assistance and into productive jobs.—The great majority of family heads receiving cash assistance want to work. Most of the poor who are able to work do in fact work, but usually in low paying and sporadic jobs. In 1977, more than three-fifths of the 3.8 million families with children with incomes below the official poverty line had either a part-time or a full-time worker. Over a million of these families were headed by women, most of whom supplemented their meager earnings with welfare. Yet, only one-fifth of these working poor families had a worker who was able to find a full-time, year-round job. In addition, almost three million other families with children live close to the poverty line despite the efforts of one or more family workers.

Even in a period of austerity and fiscal stringency, our Nation cannot afford to ignore its most pressing needs and its most needy. We must do what we can as soon as we can.

The legislation I am submitting today will help to meet the most pressing problems of our welfare system in the following ways:

increase employment and training opportunities. Those who are expected to work will be required to do so if a suitable job is available. In addition, my proposed new legislation will assure participation in a structure job search effort, add resources for training and—for those for whom a private job cannot be found—seek to provide a public sector work opportunity. There will be over 620,000 work and training opportunities for welfare eligibles including 400,000 newly funded public service employment and training slots. The program is structured to assure that required work will always pay more than welfare. Subsidized public sector jobs will only be available to those who have completed a rigorous search for private work. Thus, individuals will have substantial opportunity and incentive as well as a requirement to move from welfare to work. And the legislation assures that states will have substantial incentives to join in the effort to move individuals from welfare to work.

improve the fairness and adequacy of welfare cash assistance to needy families with children by:

—establishing a national minimum benefit (for AFDC and food stamp benefits combined) at 65% of poverty, raising benefits to 800,000 people in the 13 lowest benefit states; mandating coverage of two-parent families in the 24 states which now lack this coverage; and simplifying the benefit computation and eliminating several sources of inequity in the current system.

improve welfare administration by aligning definitions in the Aid to Families with Dependent Children (AFDC) and food stamps programs, standardizing certain deductions that are now itemized, tightening eligibility determinations, and building upon HEW's program of anti-fraud, anti-waste efforts. Furthermore, food stamps will be cashed out for a portion of the needy aged, blind and disabled population receiving Supplemental Security Income (SSI). This step towards program consolidation will extend benefits to needy individuals who are eligible but do not currently participate in the food stamp program, and simplify the welfare system for recipients and administrators.

expand the earned income tax credit to provide greater assistance to low-income working families and provide greater incentives to take private sector jobs.

provide fiscal relief to state and local governments.

These two bills will increase the incomes of 2.3 million families, or nearly 6.5 million people. They will remove from poverty 800,000 families, or 2.2 million people. They will achieve important gains in reducing error and waste. Their cost—$5.7 billion when fully implemented in FY 1982—is included in the Administration's budget projections submitted to Congress last January and fully consistent with a prudent budget policy.

It is rare that the President and Congress are given the opportunity to work together on legislation that does so much to benefit so many of the most needy.

I recognize that welfare reform is a difficult undertaking. No legislative struggle in the last decade has provided so much hopeful rhetoric or so much disappointment and frustration. We have spent several months in quiet, detailed consultations working to develop a package which I hope provides a basis for a legislative consensus.

I urge the Congress to cap a decade of debate on welfare reform with action. America's people, particularly her poor, have waited long enough for important progress in this area. A society like ours must be judged by what we do for the most needy in our midst. America must meet this challenge. Congress can make an important contribution by enacting the proposals I am making today.

JIMMY CARTER.

THE WHITE HOUSE, *May 23, 1979.*

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96th Congress, 1st Session - - - - - - - House Document No. 96-132

SUPPLEMENTAL APPROPRIATIONS AND BUDGET AMENDMENTS

COMMUNICATION

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

REQUESTS FOR SUPPLEMENTAL APPROPRIATIONS FOR FISCAL YEAR 1979 AND BUDGET AMENDMENTS FOR FISCAL YEAR 1980

MAY 23, 1979.—Referred to the Committee on Appropriations and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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THE WHITE HOUSE,
Washington, May 23, 1979.

The Speaker of the House of Representatives:

SIR: I ask the Congress to consider requests for supplemental appropriations for fiscal year 1979 in the amount of $1,131,098,000, and amendments to the request for appropriations for the fiscal year 1980 in the amount of $46,548,000.

The details of these proposals are set forth in the enclosed letter from the Director of the Office of Management and Budget. I concur with his comments and observations.

Respectfully,

JIMMY CARTER.

Enclosures.

[Estimate No. 18, 96th Congress, 1st session]

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF MANAGEMENT AND BUDGET,
Washington, D.C., May 23, 1979.

THE PRESIDENT,
The White House.

SIR: I have the honor to submit for your consideration requests for supplemental appropriations for the fiscal year 1979 in the amount of $1,131,098,000, and amendments to the request for appropriations for the fiscal year 1980 in the amount of $46,548,000. The details of these requests are contained in the enclosure to this letter.

I have carefully reviewed the proposals contained in this document and am satisfied that these requests are necessary at this time. I recommend, therefore, that these proposals be transmitted to the Congress.

Respectfully,

JIM T. MCINTYRE, Jr.,
Director.

DEPARTMENT OF AGRICULTURE

FOOD AND NUTRITION SERVICE

1980 budget appendix page	Heading	1979 supplemental request pending	1979 budget amendment	1979 revised request
1082	Food Stamp Program (In the appropriation language under the above heading delete "$245,000,000" and insert in lieu thereof *$1,038,786,000*, of which $659,086,000 shall be made available only upon enactment into law of authorizing legislation.)	$245,000,000	$793,786,000	$1,038,786,000

This request would provide funds to cover the increased cost of the program. This increase is primarily the result of the continued use in food costs and the growth in the number of eligible people participating. There is also an increase in the cost of administering the program due to the number of new applications and recertifications. This proposal would increase 1979 outlays by $793.8 million.

DEPARTMENT OF AGRICULTURE

Food and Nutrition Service

CHILD NUTRITION PROGRAM

For an additional amount for "Child Nutrition Programs," $133,000,000. *Only claims for reimbursement for meals served during 1979 received by the Secretary before April 1980 shall be eligible for reimbursement.*

This proposal would provide funds to cover the increased cost of the meals provided and the growth in the number of eligible participants in the program. This request would increase 1979 outlays by $126 million.

DEPARTMENT OF AGRICULTURE

Food and Nutrition Service

ELDERLY FEEDING PROGRAM

For commodity assistance or cash reimbursements for meals served which were financed by Federal appropriations authorized by Section 311 excluding commodity support authorized under that section, other provisions of the Older Americans Act of 1965 (42 USC 3030a), State matching funds and participant contributions, $27,000,000 in addition to amounts provided for in Public Law 95-482 without regard to Section 105 of that Act.

This proposed supplemental appropriation would provide funds to reimburse States for a portion of the cost of providing meals to the needy elderly as provided by the Older Americans Act of 1965. These funds would provide reimbursements for 148 million meals. This proposal would increase 1979 outlays by $27 million.

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

CONSTRUCTION

For an additional amount for "Construction", $52,000,000, to remain available until expended.

The proposed supplemental appropriation would provide funds for completing the construction of the National Oceanic and Atmospheric Administration's Western Regional Headquarters at Sand Point, Seattle, Washington. This proposal would increase outlays by $560,000 in 1979 and $14.8 million in 1980.

DEPARTMENT OF DEFENSE—MILITARY

MILITARY CONSTRUCTION, DEFENSE AGENCIES

(Including transfer of funds)

1980 budget appendix page	Heading	1980 supplemental request pending	1980 proposed amendment	1980 revised request
317	Military construction, Defense Agencies (In the appropriation language under the above heading insert *and in addition $39,200,000 which shall be derived by transfer from Military Construction, Air Force 1979/1983* immediately following "$244,300,000":)	$244,300,000	Language	$244,300,000

This language transfer proposal would provide for restoration of funds in the Defense Agencies military construction program which were previously reprogrammed to alleviate a funding shortfall in the NATO Infrastructure program. This proposal would reduce 1979 outlays by $2.4 million and 1980 outlays by $14.1 million.

DEPARTMENT OF DEFENSE—CIVIL

CORPS OF ENGINEERS—CIVIL

OPERATION AND MAINTENANCE, GENERAL

For an additional amount for "Operation and maintenance, general" $21,000,000, to remain available until expended.

FLOOD CONTROL AND COASTAL EMERGENCIES

For an additional amount for "Flood control and coastal emergencies", $106,000,000, to remain available until expended.

These requests would provide funds for emergency operations, preparedness, repairs and rehabilitation of flood-control works, for replenishment of the emergency fund, and for extraordinary dredging of navigation channels necessitated by floods in the Southwest, Midwest, and Southern United States. This proposal would increase outlays by $40 million in 1979 and $87 million in 1980.

DEPARTMENT OF ENERGY

1980 budget appendix page	Headings	1980 request pending	1980 proposed amendment	1980 revised request
370	Atomic defense activities—plant and capital equipment	$627,924,000	$41,000,000	$668,924,000

This proposed amendment will provide funds for the construction of the NOVA glass laser facility at the Livermore Laboratory in California. This facility is for laser fusion research. This proposal would increase 1980 outlays by $18 million.

DEPARTMENT OF THE TREASURY

UNITED STATES CUSTOMS SERVICE

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
761	Salaries and expenses	$446,857,000	$3,300,000	$450,157,000

This proposed budget amendment would provide additional funds for the antidumping and countervailing duty programs. The increase would provide 130 additional positions to handle the growth in workload during recent years and the added requirements placed on Treasury by the Multinational Trade Negotiation implementing legislation This proposal would increase 1980 outlays by $3.3 million.

GENERAL SERVICES ADMINISTRATION

AUTOMATED DATA AND TELECOMMUNICATIONS ACTIVITIES

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
802	Automated Data and Telecommunications Service, Operating expenses	$8,974,000	$248,000	$9,222,000

This request would provide for reimbursements to the Automatic Data Processing Fund for operation of the Federal Compiler Testing Center. The Center provides testing services for computer manufacturers offering ADP components to the government to assure tha these components meet government specifications. The Center was transferred to GSA from the Department of the Navy in April 1979 under authority of Public Law 89-306. In the future, the Center will be financed through the Automatic Data Processing Fund as a totally reimbursable activity with the reimbursements being provided from GSA, other using agencies, and equipment vendors. This proposal would increase outlays by $248,000 in 1980.

OTHER INDEPENDENT AGENCIES

AMERICAN BATTLE MONUMENTS COMMISSION

1980 budget appendix page	Heading	1979 supplemental request pending	1979 proposed amendment	1979 revised request
868	Salaries and expenses	$873,000	$312,000	$1,185,000

This request would provide for the additional costs of the American Battle Monuments Commission. These increased costs are a result of unfavorable exchange and inflation rate increases abroad. This request would increase outlays by $282,000 in 1979 and $30,000 in 1980.

PRESIDENT'S COMMISSION ON PENSION POLICY

1980 budget appendix page	Heading	1979 supplemental request pending	1979 budget amendment	1979 revised request
1125	Salaries and expenses (Delete the above heading and the following appropriation language.)	$2,000,000	−$2,000,000	------------

1980 budget appendix page	Heading	1980 request pending	1980 proposed amendment	1980 revised request
998	Salaries and expenses (Insert the above heading and the following appropriation language immediately after the material under the heading "Presidential Commission on World Hunger":) *For necessary expenses for the President's Commission on Pension Policy, $2,000,000, to remain available until expended.*		$2,000,000	$2,000,000

This request would change the 1979 request for a supplemental appropriation for the President's Commission on Pension Policy to a request for a 1980 budget amendment. Such a change conforms to the authorizing legislation which is likely to be enacted. This proposal would reduce 1979 outlays by $600,000 and would increase 1980 outlays by $100,000.

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96th Congress, 1st Session - - - - - - - - - - - - - - - - - - - House Document No. 96-133

THE MORMON TRAIL

COMMUNICATION

FROM

THE SECRETARY OF THE INTERIOR

TRANSMITTING

A REPORT ON THE STUDY OF THE SUITABILITY OF THE MORMON TRAIL FOR INCLUSION IN THE NATIONAL TRAILS SYSTEM, PURSUANT TO SECTION 5(b) OF PUBLIC LAW 90-543

MAY 24, 1979.—Referred to the Committee on Interior and Insular Affairs and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1979

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United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

MAY 22 1979

Honorable Thomas P. O'Neill
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Enclosed is the study of the Mormon Trail which was conducted pursuant to the provisions of the National Trails Act, Public Law 90-543, as amended, which designated the route for study as a potential component of the National Trails System. The report recommends that the 1,300-mile route of the Mormon pioneers from Nauvoo, Illinois, across Iowa, Nebraska and Wyoming to Salt Lake City, Utah, merits national recognition and should be designated as a component of the National Trails System.

Although the route was designated as The Mormon Pioneer National Historic Trail by the National Parks and Recreation Act of 1978 (P.L. 95-625), the report should be useful to a number of public and private agencies as they develop the comprehensive plan for the management and use of the trail which was called for in the Act.

Sincerely,

Cecil D. Andrus
SECRETARY

Enclosure

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THE MORMON TRAIL
A Study Report

U. S. DEPARTMENT OF THE INTERIOR

Heritage Conservation and Recreation Service
(formerly Bureau of Outdoor Recreation)
and
National Park Service

June 1978

This study report on The Mormon Trail was prepared under authority of the National Trails System Act by the former Bureau of Outdoor Recreation, Chris Therral Delaporte, Director.

Under a Secretarial Order effected in April 1978, responsibility for National Trails studies was transferred to the National Park Service. At the same time, functions of the Park Service related to Historic Preservation and identification of Natural Landmarks were transferred to the Heritage Conservation and Recreation Service, successor agency of the Bureau of Outdoor Recreation.

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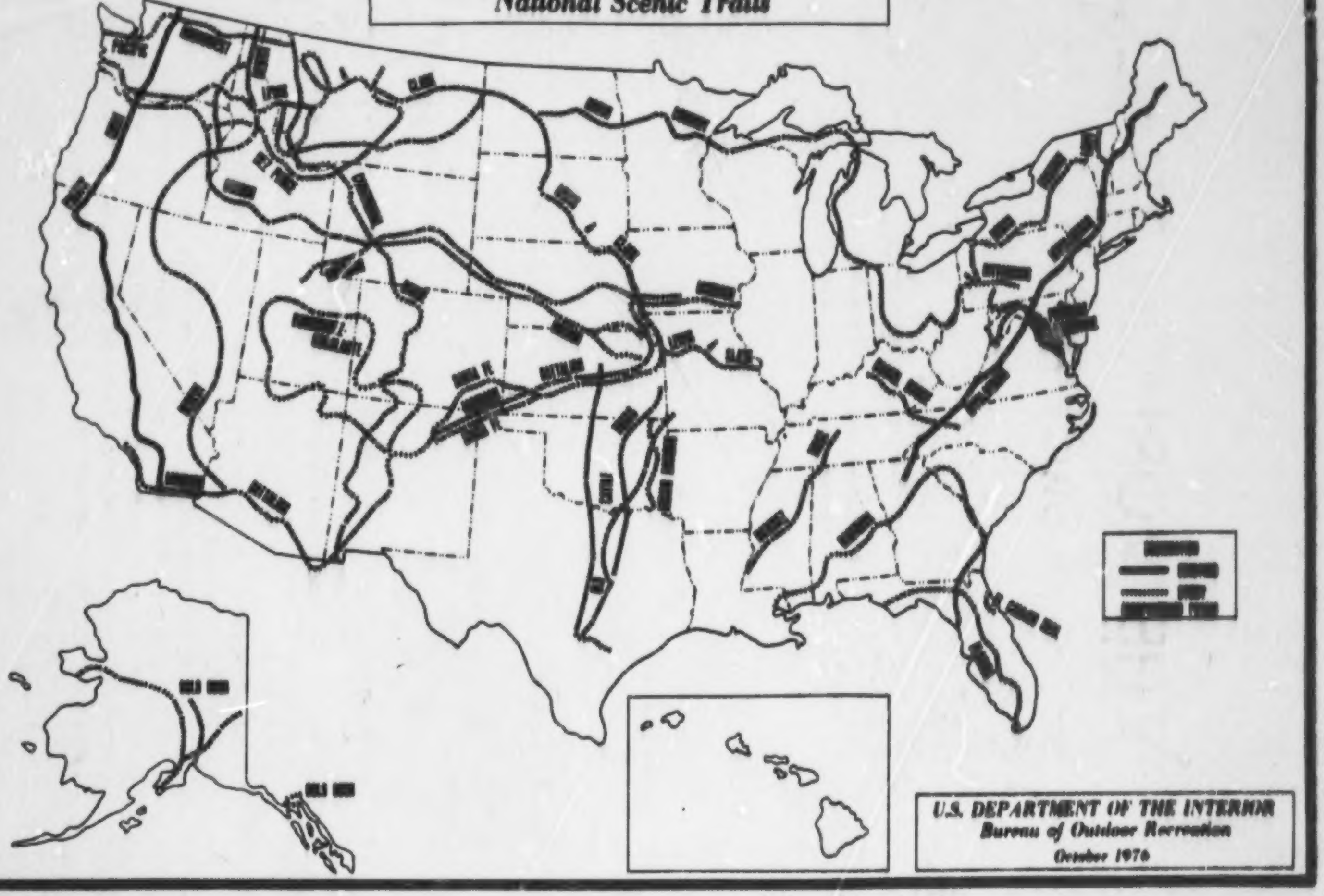
Figure 1

NATIONAL TRAILS SYSTEM
National Scenic Trails



U.S. DEPARTMENT OF THE INTERIOR
Bureau of Outdoor Recreation
October 1976

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SUMMARY OF FINDINGS AND RECOMMENDATIONS

FINDINGS

1. The route of the Mormon pioneers, some 1,300 miles (2,092 kilometers) from Nauvoo, Illinois, to Salt Lake City, Utah, merits national recognition, commemorating its unique place in American history.

2. Despite extensive developments and alteration of the landscape, 23 segments of the route, totaling approximately 700 miles (1,127 km.) and approximately 75 Mormon Trail sites were identified as having a high potential for recreation, historical interpretation, and public use. Visible remnants of the trail are few in Iowa and Nebraska but numerous in Wyoming and Utah.

3. Through the efforts of Federal land managing agencies, States, the Church of Jesus Christ of Latter-day Saints, local governments, private groups, and individuals, many historic sites have been identified, and recreation areas along the route have been developed.

4. The above attributes notwithstanding, the route does not qualify as a national scenic trail when compared to concepts set forth in the National Trails System Act, P. L. 90-543, and criteria subsequently developed for national scenic trails (appendix A).[1]

5. Appropriate memorialization may require that the National Trails System Act be amended or supplemented to provide an additional category for national historic trails (appendix B).

6. The Mormon Trail is one of several components which make up the great migration corridor of the Oregon-California Trail from Grand Island, Nebraska, to Fort Laramie, Wyoming. Across much of Wyoming, the Mormon, California, and Oregon Trails virtually coincide.

7. Land ownership along the route is approximately 35 percent public and 65 percent private.

8. Action to commemorate and designate the Mormon Trail as an addition to the National Trails System would supplement the concurrent Oregon Trail proposal. Commemoration of both trails is important to preserve the cultural and historical significance of this great emigration corridor.

---

[1] In comparing the Mormon Trail with the criteria established for a national scenic trail, it became clear that several segments of the trail do not qualify as a land-based national scenic trail. A large portion of the trail has been destroyed by acts of man and nature. Many of the elements considered objectionable for a national scenic trail, including highways, roads, mining areas, power transmission lines, commercial and industrial developments, and range fences, are found along the route. Due to these and other actions, many original campsites and other points of interest can no longer be seen. As a result, a non-motorized hiking trail constructed along the original route would probably not receive a significant amount of public use along its entire length. Therefore, a continuous hiking trail along the original Mormon route would be neither desirable nor practical.

RECOMMENDATIONS

It is recommended that:

1. the route be designated as the Mormon Pioneer National Historic Trail and declared a component of the National Trails System;

2. the Secretary of the Interior encourage and assist Federal, State, local, and private interests to use existing Federal and State programs in further planning and development of the unique and significant recreational and historical aspects of the Mormon Trail identified in this report as high-potential route segments;

3. close coordination be established and maintained among the public and private entities involved with the future planning and development of the Oregon and Mormon Trails to encourage the provision of complementary services and facilities and avoid duplication of effort;

4. the existing voluntary organizations of public and private entities be expanded to coordinate the planning, development, operation, and maintenance activities relating to the Mormon Historic Trail; and

5. to enhance the enjoyment of those traveling along the route to other destinations and to facilitate retracement and connect the historic sites and recreation areas, the route of the Mormon pioneers be marked along public roads and highways which approximate the actual historic migration; the trail be marked by the States with directional signs; and $300,000 in Federal funds be made available for this purpose.

The Department of the Interior stands ready to assist in implementing the above recommendations and to provide any data or related information compiled during the course of this study which might be helpful for that purpose.

INTRODUCTION

STUDY AUTHORITY

The National Trails System Act of October 2, 1968 (Public Law 90-543), established the following policy for a national system of trails:

> In order to provide for the ever-increasing outdoor recreation needs of an expanding population and in order to promote public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas of the Nation, trails should be established (i) primarily, near the urban areas of the Nation, and (ii) secondarily, within established scenic areas more remotely located. The purpose of this Act is to provide the means for attaining these objectives by instituting a national system of recreation and scenic trails, by designating the Appalachian Trail and the Pacific Crest Trail as the initial components of that system, and by prescribing the methods by which, and the standards according to which, additional components may be added to the system.

The National Trails System Act created three types of trails: national recreation trails, national scenic trails, and connecting or side trails. National recreation trails provide for a variety of outdoor recreation uses in or near urban areas. They may be designated by the Secretary of the Interior or by the Secretary of Agriculture where lands administered by him are involved. National scenic trails are long-distance trails that provide for maximum outdoor recreation potential and for the conservation and enjoyment of nationally significant scenic, historical, natural, or cultural qualities of the area. They may be designated only by the Congress. Connecting or side trails provide access to or connect national recreation or scenic trails and may become part of the trail to which they are joined.

In addition to the 2 initial components of the National Trails System, 22 other routes, as shown in figure 1, were identified in the Act, as amended, for future study and possible inclusion as national scenic trails. One of the study routes, as identified in section 5(c) of the Act, is the

> Mormon Trail, extending from Nauvoo, Illinois, to Salt Lake City, Utah, through the States of Iowa, Nebraska, and Wyoming.

The Mormon Trail study is legislatively required to determine the feasibility and desirability of designating the Mormon Trail as a component of the National Trails System.

This report generally describes the route of the original pioneer group of Mormons, as shown in figure 2, and defines the associated scenic, historical, natural, cultural, and recreational qualities which establish the national significance of this 1,300-mile (2,092-kilometer) trail.

Since most of the original route has been paved over or plowed under, only certain segments having high potential for public recreation use and historic interpretation were identified and evaluated. In identifying segments, it was recognized that the relationship of the route to roads and highways is an important factor. Therefore, the following accessibility categories were developed to describe different types of segments:

Highway Segments - Portions of the route overlaid or closely paralleled by Federal and State highways which could be utilized by motorists and possibly for hiking and bike trails within the rights-of-way. About 300 miles (483 km.) of trail segments are in this category, and their lengths vary from 2 to 100 miles (3 to 161 km.).

Road Segments - Sections of the route overlaid or closely paralleled by primitive or improved roads other than Federal or State highways which could be utilized for hike and bike or horse trails to provide a link between highways and cross-country routes. Road segments total about 300 miles (483 km.) and vary in length from 2 to 60 miles (3 to 97 km.).

Cross Country Segments - Remnants of the original route away from highways or roads which could be used as hiking and horse trails. These segments total about 100 miles (161 km.) and range from 2 to 25 miles (3 to 40 km.) in length.

ACKNOWLEDGMENTS

The Mormon Trail Study was a cooperative effort led by the Mid-Continent Region, Heritage Conservation and Recreation Service (formerly Bureau of Outdoor Recreation), Denver, Colorado. Study participants who provided information and review of the preliminary draft report and environmental statement included representatives of State, Federal, and local agencies, the Church of Jesus Christ of Latter-day Saints, Mormon Pioneer Trail Foundation, historical societies, and individuals having a direct interest.

The study was greatly assisted by previous research and recent field investigations by Dr. Stanley B. Kimball, noted authority on the historic Mormon Trail. The work of the Heritage Conservation and Recreation Service was also facilitated by the efforts of many public agencies and organizations which have initiated preservation and interpretation programs. Information utilized from the Oregon Trail Study, conducted by the Northwest Regional Office of the Heritage Conservation and Recreation Service, has been of great assistance, as the two trails parallel or coincide over a major part of the trail corridor.

Public participation and comment were obtained through four public meetings in four States. The study was explained and public use potentials illustrated through taped slide presentations. A public information brochure, distributed before and at these meetings, described alternatives for establishment and administration of the trail. Public response was solicited, and all comments, verbal and written, were considered in the preparation of this report. The majority of responses received favored the alternative presented as the major proposal in the study report.

The following public agencies, organizations, and citizens participated in the study:

ILLINOIS
State Department of Conservation
Division of Parks and Memorials

IOWA
Iowa State Historical Department
Iowa State Historical Society

IOWA, Continued
- Iowa Conservation Commission
  - State Parks Division
  - State Forest Division
- Iowa State Highway Commission
- Iowa State Office of Planning and Programming
- Council Bluffs Parks and Recreation Department

NEBRASKA
- Nebraska Game and Parks Commission
- Nebraska State Historical Society
- Nebraska State Department of Roads
- Nebraska Department of Economic Development
- Nebraska State Office of Planning and Programming
- Omaha City Planning Department

WYOMING
- Wyoming Recreation Commission
- Wyoming Travel Commission
- Wyoming State Highway Department
- Wyoming State Archives and Historical Department
- University of Wyoming Department of History
- Wyoming Game and Fish Department

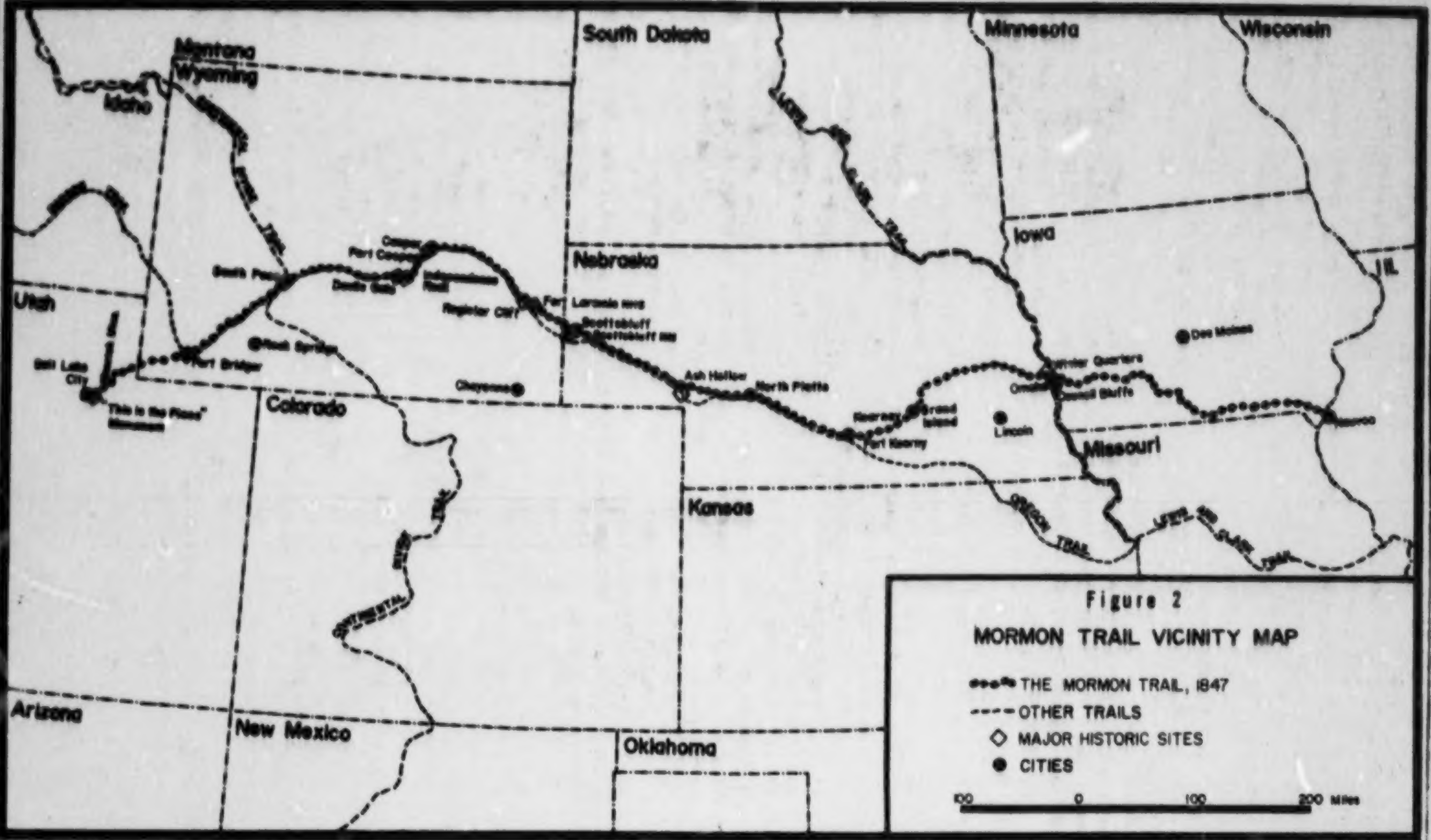
UTAH
- Utah Department of Highways

UTAH, Continued
- Utah Department of Natural Resources
  - Division of State Parks and Recreation
  - Outdoor Recreation Agency
- Utah Department of Development Services
  - Division of State History
- University of Utah, Department of History

ORGANIZATIONS AND CITIZENS
- Church of Jesus Christ of Latter-day Saints
  - Wendell J. Ashton, Public Communications Department
- Mormon Pioneer Trail Foundation
  - C. Booth Wallentine
  - Dr. Stanley B. Kimball
- Nauvoo Restoration, Inc.
- Mr. and Mrs. Paul Henderson
- Aubrey L. Haines (NPS, Retired)

FEDERAL AGENCIES
- National Park Service
- Bureau of Land Management
- Federal Highway Administration
- Fish and Wildlife Service
- Army Corps of Engineers
- Bureau of Reclamation
- Forest Service

The Bureau appreciates the assistance provided by all study participants.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Wyoming
Idaho
Utah
Salt Lake City
"This is the Place" Monument
Fort Bridger
Rock Springs
South Pass
Devils Gate
Fort Casper
Casper
Independence Rock
Register Cliff
Fort Laramie
Scottsbluff
Cheyenne
Colorado
Arizona
New Mexico
South Dakota
Nebraska
Ash Hollow
North Platte
Kearney
Grand Island
Fort Kearny
Lincoln
Omaha
Winter Quarters
Council Bluffs
Des Moines
Kansas
Oklahoma
Minnesota
Iowa
Wisconsin
ILL
Missouri
Nauvoo
OREGON TRAIL
LEWIS AND CLARK TRAIL
CONTINENTAL DIVIDE TRAIL
THE MORMON TRAIL, 1847
OTHER TRAILS
MAJOR HISTORIC SITES
CITIES
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Figure 2

MORMON TRAIL VICINITY MAP

NATIONAL SIGNIFICANCE

BACKGROUND

The history of the United States during the nineteenth century was one of discovery, exploration, and settlement of a vast continental area. Within the space of a few years the boundaries of the United States were pushed across half the continent. The most significant aspect of this era was the movement of emigrants. The optimistic farmer, moving with his family to Oregon; the persevering Mormon, searching for a home in which he might live in peace; and the adventurous Forty-Niner, hurrying to the new El Dorados with visions of the wealth that awaited him there -- all these carried American civilization westward and built the foundations for a new society.

The Mormon migration was unique by contrast to other migrations and was one of the dramatic events in the history of American westward expansion. It was a permanent movement of a whole people -- family groups led by Brigham Young to a new location and a fresh start. Except for possibly the segment in Iowa, Young's Mormon pioneers did not originate the route they followed. It was a combination of several existing routes beginning with the earlier trapper, missionary, and Indian trails, and the more widely known Oregon, Overland, and California Trails. Yet, the Mormon emigration "differed profoundly from the Oregon and California westward migrations."[1]

For their journey from Nauvoo, Illinois, Brigham Young set forth the organization and rules by which the Mormons would travel. For example, the pioneers were directed to organize themselves into tens, fifties, and hundreds. During 1847 these groups were organized in semi-military fashion with Brigham Young as general and others serving as company captains, hunters, and scouts.

Unlike most of the California- or Oregon-bound emigrants, the first thoughts of Brigham Young's pioneer company were to improve the journey for the Mormons who would follow. They "noted good campgrounds, wood, water, grass, measured distances and set up mileposts."[2] *The Emigrants' Guide*, compiled by William Clayton, a member of the Mormon pioneer party, became the guidebook for thousands of emigrants who followed their trail.

The Mormons established semi-permanent camps and ferries, graded down the steep approaches to fords, and cleared boulders out of the path. In contrast, the Oregon- and California-bound emigrants continued to follow the steep descent at Windlass Hill above Ash Hollow. They did little to make the route easier because none expected to go that way again. The Mormons not only traveled west, but also eastward to pick up supplies and new converts at the Missouri River, or to meet faltering companies and help them on to Salt Lake City.

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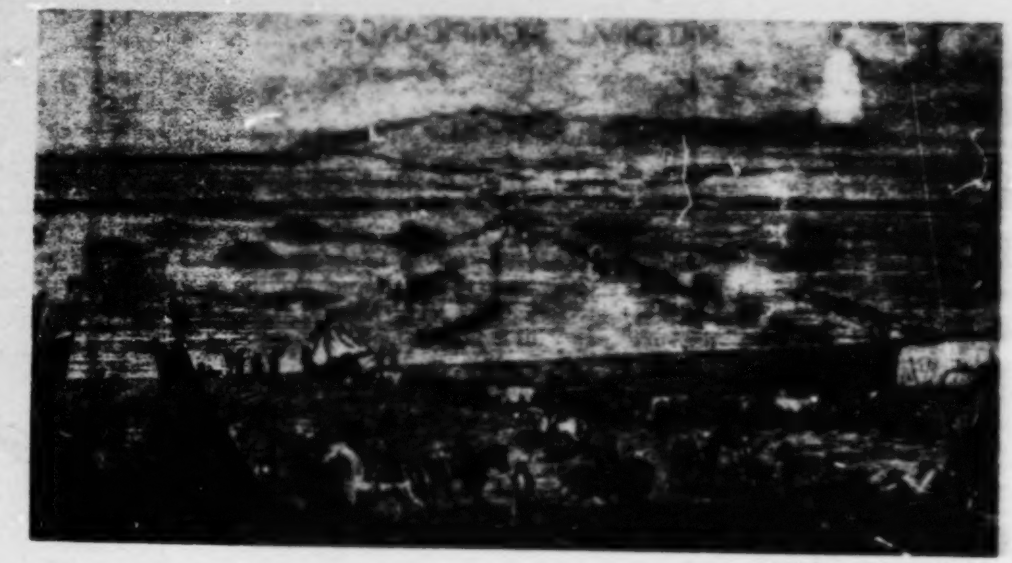
[1] Wallace Stegner, *The Gathering of Zion -- The Story of the Mormon Trail* (New York: McGraw-Hill Book Company, 1964), p. 11.

[2] Ibid.



Utah State Historical Society

"Overland Journeys" – A Wagon Train Crossing the Platte River.

The Mormons were one of the principal forces in the settlement of the West. "They opened up southern Iowa, from Locust Creek to the Missouri, made the first roads, built the first bridges, and established the first communities along the route."[3]

They made Winter Quarters (Florence, a suburb of Omaha) and Kanesville (Council Bluffs) into outfitting points that rivaled Independence, Westport, and St. Joseph of Oregon Trail fame. "They defined the road up the north side of the Platte that is now the route of both U. S. 30 and the Union Pacific Railroad."[4]

NATIONAL QUALITIES

Existing national monuments, Federal, State, and local recreation areas, and scenic tour routes provide a full range of outdoor recreation opportunities along or accessible from the Mormon Trail.

Many historic points along the 1,300-mile (2,092-km.) route have high potential for historical interpretation and/or recreation. National recognition would enhance the importance of historic values commemorated at these sites and encourage preservation and interpretive facilities for a trail now considered only part of a broad migration corridor to the west.

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[3] Ibid., p. 6

[4] Ibid., p. 7

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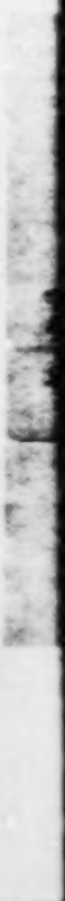

Most of the original Mormon Trail has disappeared across Iowa and Nebraska. Croplands and highways have removed all but a few traces of the route. However, in the western sections through Wyoming and Utah, much of the environment is little different today than it was in 1847. In these sections, numerous ruts and other trail evidence remain undisturbed.

Various bluffs and geologic features form impressive landmarks along the natural migration corridor. Notable among these are the Mississippi and Des Moines Rivers, which the Mormons crossed in their journey from Illinois through Iowa. Farther west in Nebraska the corridor included such prominent natural landmarks as Courthouse and Jail Rocks, Chimney Rock, and Scotts Bluff. Now a national monument, Scotts Bluff offers a sweeping panorama of the North Platte Valley from its summit. From this point, Chimney Rock lying 25 miles (40 km.) east and Laramie Peak looming 100 miles (161 km.) west can be located.

In contrast to the pastoral scenes of Iowa and the river valley of Nebraska, the mountain and desert scenery of Wyoming and the forested rugged mountains and canyons of Utah provide awe-inspiring, ever-changing scenery.

Spectacular and colorful rock formations and the snowcapped Wind River Range border the trail. The scene along the Sweetwater River remains virtually

Utah State Historical Society

Roadometer designed and used by the Mormons to measure the distance traveled each day is now in the Deseret Museum, Salt Lake City.

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Nebraska Game and Parks Commission

Courthouse and Jail Rocks south of Bridgeport, Nebraska, were noted in many emigrant diaries.

unchanged with features including Devils Gate and Split Rock which rises 1,000 feet (305 meters) above the valley floor in this semidesert region.

Significant segments of the trail and adjacent trails were used by early-day Indians, ancient cliff-dwelling tribes, explorers, missionaries, fur traders, mountain men, and the fabled miners. Ghost towns, mining operations, museums, and reconstructed "boom towns" associated with the Old West are in evidence along the trail corridor.

The potential for connecting trails of nationwide interest is exceptional. In addition to following the corridor of the nationally known Oregon Trail, the Mormon Trail crosses the Lewis and Clark Trail at the Missouri River and the Continental Divide Trail at South Pass. In places it parallels the Overland Stage, Cherokee, and Pony Express Trails. It has connections with several other Old West routes, including the Lander Cut-Off and the Sidney-Deadwood, Bozeman, Pikes Peak, and Cheyenne-Deadwood Stage Trails, to name only a few.

A more complete list of historical and archeological sites along the Mormon Trail corridor that are on the National Register of Historic Places may be found in appendix C. For a more extensive list of additional sites not on the National Register and related to the Mormon Trail, refer to appendix D. At the request of the State Historic Preservation Offices, locations of the latter have been omitted to avoid damage to unprotected sites.

PUBLIC INTEREST

Developed recreation areas, rivers, reservoirs, wayside rest areas, and historic sites along the entire trail corridor provide excellent opportunities and are heavily used for fishing, camping, hiking, picnicking, and historical interpretation. Interest by Americans in outdoor recreation and the heritage of their country is increasing yearly. This is witnessed by the expanding numbers of people visiting our national parks and historic sites.

Many publications and diaries have described the story of the Mormon Trail and the thousands who experienced hardship on their journey to the Valley of the Great Salt Lake. Public interest in preserving, commemorating, and interpreting the history of the Mormon Trail has been evident for many years. The subject was discussed at hearings of the 68th Congress when legislation was introduced for the Old Oregon Trail.

State and local historical societies and other public and private organizations have erected various markers and memorials along the route which is delineated on U. S. Geological Survey maps for Utah and Wyoming. Brochures and maps of scenic-historic tour routes are available in each State, and highway departments have cooperated with historical societies by providing interpretive information at wayside rest stops.

At numerous other locations, efforts have been made by all levels of government and the private sector to preserve and restore outstanding historical and natural features, including the continuing restoration of Nauvoo, Illinois. A living historical museum which attracted 460,000 visitors in 1975 has been created at Pioneer Trail State Park near Salt Lake City. In addition, Temple Square, the Mormon Pioneer Museum, and historical features in Salt Lake City attracted over two million visitors that same year Other historic sites, such as the "Mormon Pioneer Memorial Bridge" near Winter Quarters (Omaha) and the "Mormon Pioneer Display" at the Wayne County Historical Museum in Corydon, Iowa, have been dedicated in recent years.

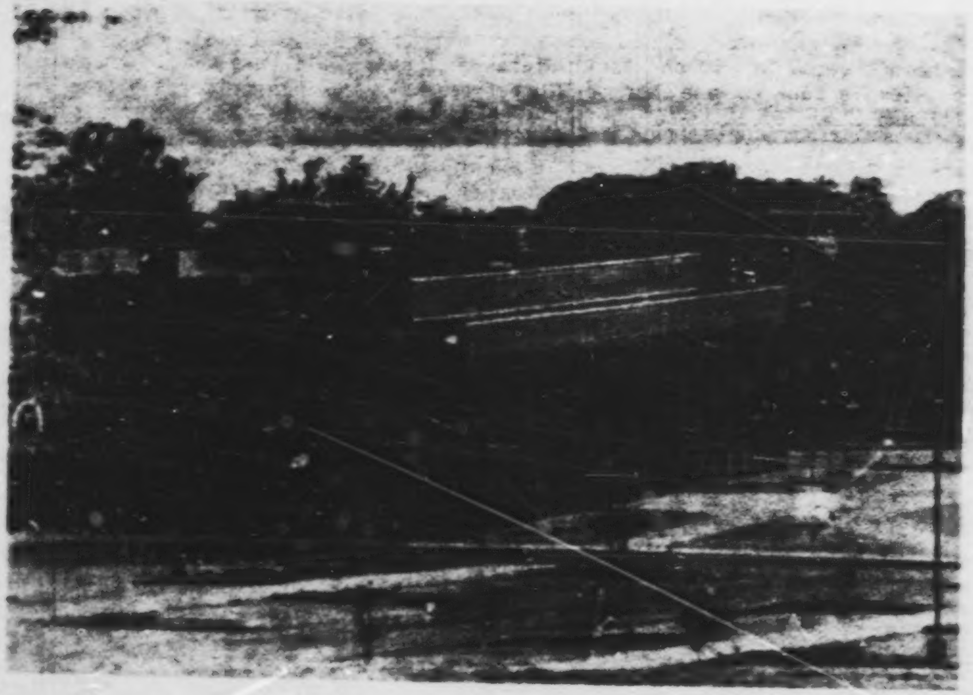
Dr. Stanley B. Kimball

"This is the Place" monument located in Pioneer Trail State Park at the mouth of Emigration Canyon, Utah, marks the climax of the Mormon Trail

THE PLACE OF DEPARTURE

It was from Nauvoo, Illinois, on the east bank of the Mississippi River, that the original emigrant group of Mormons departed on their epic journey in February 1846. During the first half of the nineteenth century, Nauvoo grew to a population of 15,000 and was the principal headquarters of the Mormons. Between 1839 and 1846 Nauvoo became the largest city in Illinois.

Although some of the buildings, including the temple, were destroyed after the Mormons left, the city of Nauvoo was largely preserved. Today the town's population is less than 1,500, but many of the dwellings erected by the Mormons still stand and have been or are being restored. Structures that have been restored include the Joseph Smith homestead, Brigham Young's home, the Heber C. Kimball home, the "Times and Seasons" building, and the Webb Wagon and Blacksmith Shop, among others. The community of Nauvoo is noted for its historic background, beautiful surroundings, nearby Nauvoo State Park, and extensive vineyards. Nauvoo attracted some 100,000 visitors in 1975.



Nauvoo Restoration, Inc.

Dedication of a new visitor center at Nauvoo, Illinois, in 1971 marked a major step forward in restoration of this historic city

THE TRAIL IN IOWA

After crossing the Mississippi River from Nauvoo to present-day Montrose, Iowa, the first portion of the Mormon journey followed primitive territorial roads and Indian trails across Iowa to Council Bluffs. The Iowa portion of the trail was used extensively for less than one year - from February 1846 through September 1846.

The Iowa trek was the most difficult part of the journey. Not only were the basic skills of emigrating and colonizing learned, but several permanent camps were established for those who followed. The heart of the Mormon settlement in Iowa, from July 1846 to the spring of 1852, was Kanesville, now part of Council Bluffs.

BOR Photo

By March 1846 over 3,000 Mormons had gathered at Sugar Creek Camp, site of the first encampment in Iowa, near Montrose.

The first 30 miles (48 kilometers), which includes the Mississippi and Des Moines Rivers, Shimek State Forest, and Lacey-Keosauqua State Park, of the 280-mile-long (451-km.) trail through Iowa is the most scenic portion. Between the State Park and Mt. Pisgah, open fields predominate. From Mt. Pisgah to Council Bluffs, the route traverses open, rolling farmland with occasional woods and windbreaks.

Most visible remains of the trail in Iowa have been erased by cultivation and urban development. Thus, the majority of historic places are sites or landmarks rather than locations containing physical traces. However, there

Iowa State Conservation Commission

Shimek State Forest contains 7,000 acres (2,833 ha.) along the trail and accommodates primitive camping, picnicking, fishing, and hiking.

is visible trail evidence in the Lacey-Keosauqua State Park, Chariton River Camp, and Mormon Trail Park.

HIGH-POTENTIAL ROUTE SEGMENTS

Three high-potential segments exist in the Illinois-Iowa portion of the Mormon Trail. Combined, they total over 35 miles (56 km.), or 13 percent, of the Iowa trail length. There are over 30 significant historic sites in the Iowa trail corridor, as listed by segment in table 1 and shown on figure 3 at the end of this chapter. These segments coincide with hiking, biking, and horse trail routes proposed by the Iowa State Conservation Commission.[1] Potentials for public recreation along the route consist of an urban hike and bike trail in the Omaha-Council Bluffs area and hiking and horse trails in the other high-potential segments. A discussion of the high-potential route segments follows, with each keyed by letters in parentheses to figure 3.

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[1] Steve Brower and Damon Oklerking, *A Corridor Trail Network for Iowa's Landscape* (Iowa State Conservation Commission, 1973).

(A) Des Moines River Segment - This 11-mile (18-km.) segment, bordered on the south by the Des Moines River and on the north by Shimek State Forest, begins at Croton and ends near Bonaparte at the site of Reed's Creek Mormon camp. The Daughters of the American Revolution have commemorated the Des Moines River Crossing by erecting a marker one-quarter mile (.4 km.) west of the Bonaparte Bridge.

(B) Lacey-Keosauqua State Park Segment - Passing through continuous woodland, this 4-mile (6-km.) segment has several developed hiking and horseback riding trails in the State Park. Two miles of marked hiking trail follow the Mormon Trail along the Des Moines River from Ely's Ford Mormon Crossing to the Keosauqua Bridge. Also, a hiking trail approximating the Mormon route could be developed in the Shimek State Forest.

(C) Council Bluffs Segment - The length of this segment may vary between 5 and 20 miles (8 and 32 km.), pending master planning, actual location of trails, and determination of a motor route through the Omaha-Council Bluffs metropolitan area. The Council Bluffs area is recognized as one of the regions of Iowa which will need the most immediate and extensive trail development and presents an opportunity for linking the State trail systems of Iowa and Nebraska.[2]

Iowa State Conservation Commission

Lacey-Keosauqua State Park on the Des Moines River comprises over 2,500 acres (1,012 ha.) and contains Ely's Ford, a river crossing on the Mormon Trail.

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[2] Ibid.

The Missouri River and its bluffs are scenic attractions in this area. Among historic sites found here is the Mosquito Creek campsite where the 500-man Mormon Battalion was formed in 1846 to march to southern California to aid in the war with Mexico. Another site is Council Point, which marks the ferry crossing of the Missouri River. Among the remaining Mormon sites in Iowa, some of the more significant ones include Sugar Creek Camp; Locust Creek Camp near Sewell, site of the writing of the words to the Mormon hymn "Come, Come Ye Saints"; Garden Grove Camp and Way Station; Mt. Pisgah Camp, a supply depot and burial ground; and the settlements of Kanesville and Hyde Park in the vicinity of Council Bluffs.

PUBLIC AGENCY INVOLVEMENT IN IOWA

About 97 percent of the trail in Iowa is on private land; the remaining 3 percent is on public land, primarily in the State park and forest. Over 55,000 acres (22,258 hectares) of public recreation lands are accessible to the trail. About 20,700 acres (8,377 ha.) are contained in State parks, recreation areas, game areas, and forests, with approximately 700 acres (283 ha.) in county parks.

The areas attracted about 2.3 million visitors in 1975. The trail does not pass through Federal lands in Iowa; however, there are nearly 34,000 acres (13,759 ha.) of public recreation land and water at the Corps of Engineers' Rathbun Reservoir located 12 miles (19 km.) north of the trail in south-central Iowa.

The Iowa State Comprehensive Outdoor Recreation Plan (SCORP) specifically mentions the Mormon Trail and describes historic sites along the route. It also states that it is "vitally important that a national and State trail program accommodate and reflect the needs of metropolitan areas . . . " The SCORP also mentions that "national leadership is essential for the development of a comprehensive trail program at all levels . . ."[3]

MT. PISGAH MORMON
PIONEER WAY STATION

BOR Photo

Mt. Pisgah, a camp for westward-bound Mormon pioneers until 1852, is today a monument to those who died there.

The Iowa Department of History and Archives plans and implements a statewide historic preservation policy, provides public information on history, documents and coordinates the marking of historic sites, and assists in educational programs.

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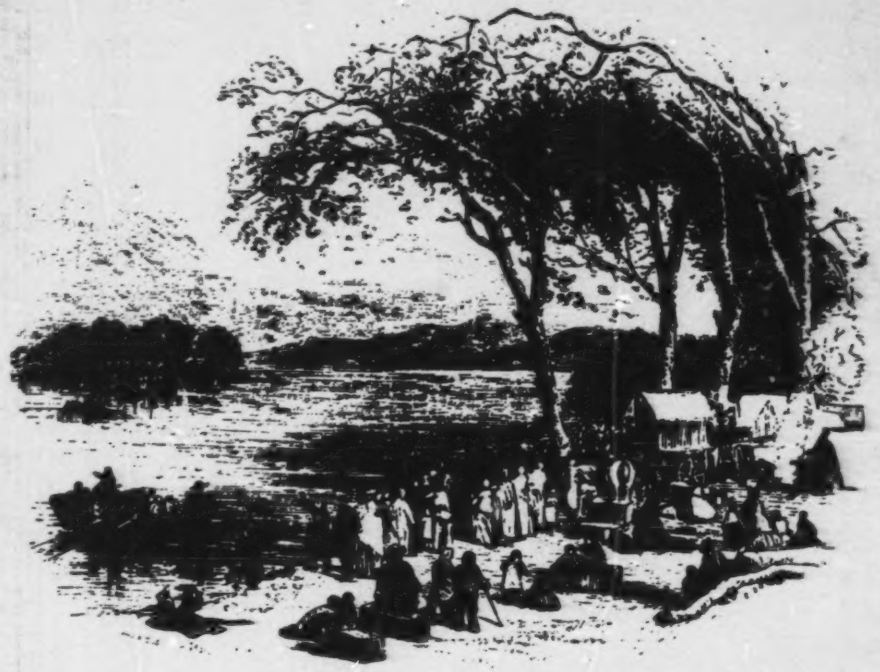
[3] *Iowa State Outdoor Recreation Plan - 1972* (Iowa State Conservation Commission, 1972), Vol. 1, 5a.



Mormon encampment on the Missouri River. Utah State Historical Society

The Iowa State Highway Commission, several counties, and the Mormon Pioneer Trail Foundation have cooperated in the placement of trail markers at intersections of the trail with highways and county roads. There are approximately 55 such markers across the State. The nonprofit Mormon Pioneer Trail Foundation, founded in 1968, promotes research, education, and development of the Mormon Trail and other affiliated trails.

About 25 recreation areas, comprising some 14,000 acres (5,666 ha.), along or close to the Mormon Trail are owned or managed by the Iowa State Conservation Commission and local agencies.

The Omaha-Council Bluffs Metropolitan Planning Agency, assisted by a Riverfront Development Task Force, is developing plans that will restore and improve a 54-mile (87-km.) reach of the Missouri River, including development of hiking, biking, and horseback riding trails along the river in Iowa and Nebraska. This could include any known portions of the Mormon Trail and link with historical points of interest and recreation areas.

TABLE 1 - ILLINOIS-IOWA ROUTE SEGMENTS AND SITES[1]

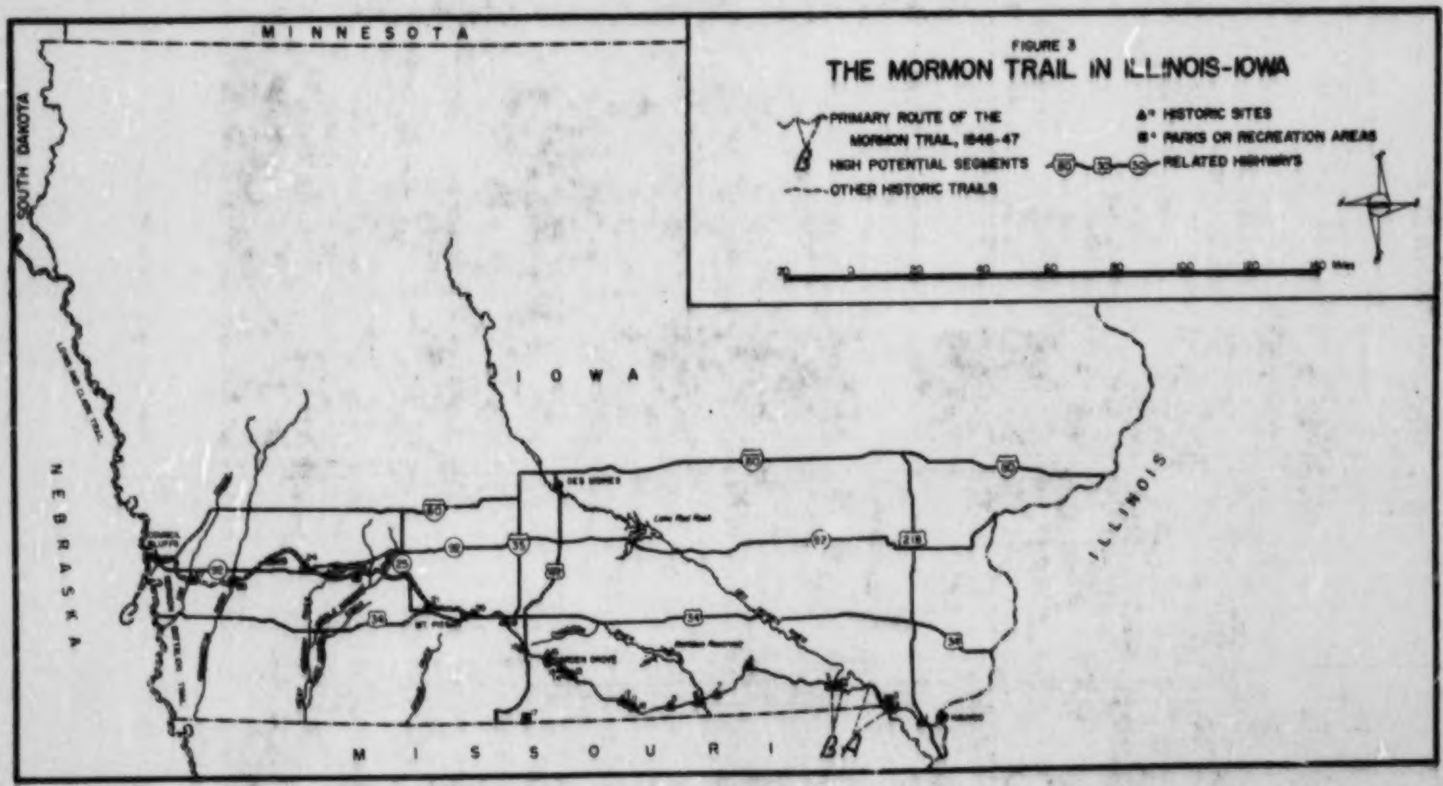
Ref.	High-Potential Segments	Ref.	Historic/Recreation Sites	Type of Site[2]		
				H	R	M
A	Des Moines River	2	Croton Civil War Memorial Park	X		
		3	Shimek State Forest		X	
B	Lacey-Keosauqua State Park	4	Lacey-Keosauqua State Park	X	X	X
		5	Indian Creek Camp	X		X
C	Council Bluffs Urban		COUNCIL BLUFFS			
			Mosquito Creek Camp	X		X
			Council Point Camp	X		X
			Lake Manawa State Park		X	
			Mormon Ferry Sites across Missouri River	X		X
	Other Segments		NAUVOO ILLINOIS	X		X
		1	Sugar Creek Camp	X		X
		6	Davis County Camp			X
		7	Coffman's Settlement	X		
		8	Chariton River Camp	X		X
		9	Shoal Creek Camp	X		X
		10	Hickory Grove Camp	X		X
		11	Locust Creek Camp No. 1	X		X
		12	Locust Creek Camp No. 2	X		X
		13	Mormon Camp	X		X
		14	Pleasant Grove Camp	X		X
		15	Muddy Creek Camp	X		X
			GARDEN GROVE - Historic Park	X	X	X
		16	Site of Mormon "Way Station" Settlement	X		X
		17	Nine Eagles State Recreation Area	X	X	
		18	Willow Bridge Camp	X		X
		18a	Lost Camp	X		X
		19	White Breast Creek Camp	X		X
		20	Mormon Camp	X		X
			MT. PISGAH - Mormon Way Station	X		X
		21	Broomberry Hill Camp	X		X
		22	Mormon Trail Park	X	X	X
		23	Reno Cemetery	X		X
		24	Pleasant Valley Camp	X		X
		25	Campsite	X		X
		26	Nishnabotna River Camp	X		X
		27	Keg Creek Camp	X		X

[1] All segments and sites are keyed to figure 3.

[2] Site designations are indicated as: H-Historic Sites; R-Recreation Sites; M-Mormon Trail Sites.

FIGURE 3

THE MORMON TRAIL IN ILLINOIS-IOWA


PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
A HIGH POTENTIAL SEGMENTS
B
OTHER HISTORIC TRAILS
▲* HISTORIC SITES
■* PARKS OR RECREATION AREAS
80 35 52 RELATED HIGHWAYS
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SOUTH DAKOTA
IOWA
NEBRASKA
MISSOURI
ILLINOIS
LEWIS AND CLARK TRAIL
COUNCIL BLUFFS
DES MOINES
Lake Red Rock
MT. PISGAH
GARDEN GROVE
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THE TRAIL IN NEBRASKA

Nebraska State Historical Society

Many Mormons perished at Winter Quarters where a memorial now stands.

Much of the Mormon strength had been dissipated and supplies exhausted by the trek across Iowa. Thus, in September 1846 the community of Winter Quarters was established at the present site of Florence, a suburb of Omaha. By year's end about 3,500 Mormons were settled there. In addition, over 200 were camped just across the Missouri River in Iowa.

In the spring of 1847 Brigham Young's pioneer company left Winter Quarters to establish a route for the large number of emigrants who would follow. During the California Gold Rush of 1849, the trail north of the Platte River, which until this time had been used mainly by Mormons, became known as the Council Bluffs Road. This route was an integral part of the Great Platte River Road.[1]

Through Nebraska the trail is approximately 500 miles (805 kilometers) long. A dominant physical feature of the landscape is the Platte River which is broad, shallow, and bordered in many places by low sandhills. Level terrain and an east-west orientation of the river made it a natural emigration and traffic corridor. The Oregon, California, Mormon, and Pony Express Trails, all originating in different locations, converged in the Platte Valley near Kearney. Although the well-established Oregon Trail was along the south bank, the Mormons chose a parallel path just across the river on the north bank and followed this corridor along the Platte and North Platte Rivers for about 450 miles (724 km.).

Except for wooded and rolling land between the Missouri and Elkhorn Rivers, there are no abrupt changes in the scenic character of the route in Nebraska. However, the fertile plains gradually give way to the arid and broken hills to the west. Today more than 90 percent of the land along the Nebraska route is used for agriculture, and most visible traces of emigrant use have been erased, although wagon ruts left by emigrants can still be seen in a few places.

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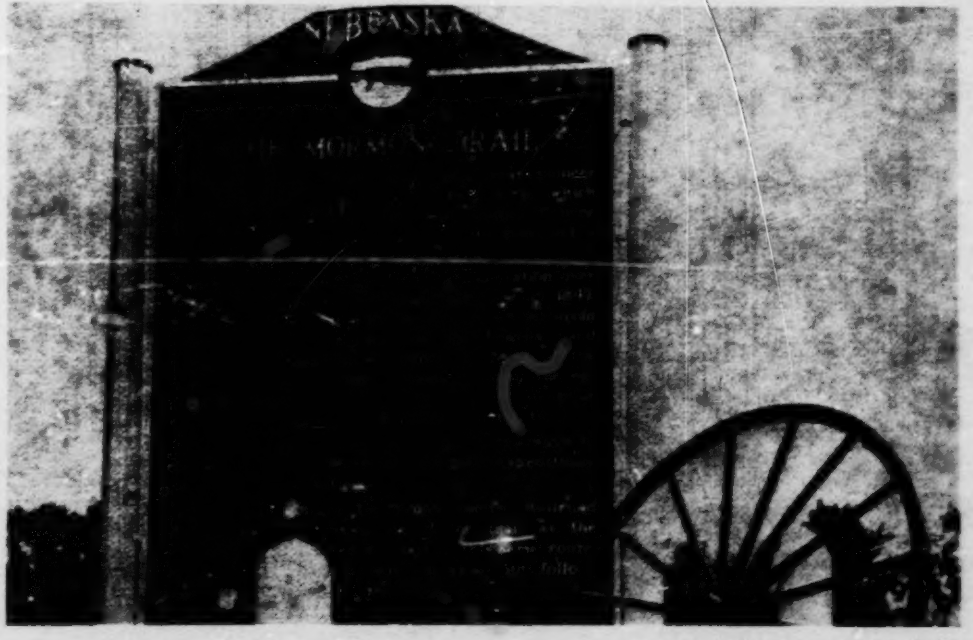
[1] Merrill J. Mattes, *The Great Platte River Road* (Nebraska State Historical Society, 1969).

HIGH-POTENTIAL ROUTE SEGMENTS

Eight segments, totaling about 375 miles (604 kilometers), or 75 percent of the route, have high potential for public recreation and historic interpretation. Nearly 50 Platte River historic sites, listed by segment in table 2 and shown on figure 4 at the end of this chapter, have high potential for public use. Three sites, Scotts Bluff (National Monument) and Fort Kearny and Ash Hollow (State Historical Parks), have already received extensive interpretive development.

Approximately 230 miles (370 km.) of the high-potential route parallel highways, about 70 miles (113 km.) follow secondary roads and 75 miles (121 km.) are cross country. Along highway and road segments, the primary potential is for auto travel. Additional potential exists in some areas for development of bike, hike, and horse trails. Cross-country segments could be developed under State and local auspices for hiking or horseback riding trails. A discussion of the high-potential route segments and their associated historic sites follows, with each segment keyed by letters in parentheses to figure 4.

(A) Greater Omaha Urban Segment - As discussed earlier, potential exists in the Omaha-Council Bluffs area for a hiking and biking trail along the



Nebraska Game and Parks Commission

Historic marker at junction of U. S. Highway 30 and Nebraska Highway 92 in Mormon Trail State Wayside Park

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Missouri River, the Corps of Engineers' levee system, and along portions of the route through the northern edge of the greater Omaha area. Although evidence of early trails has vanished in Omaha, this 30-mile (48-km.) segment provides an opportunity for interpretive development and a link with the proposed Lewis and Clark Trail. Important historic sites in this area include the Cold Spring Campsite, Cutler's Park Campsite, Bellevue ferry sites, and Winter Quarters.

(B) Elkhorn River Segment - This 4-mile (6-km.) cross-country section along the Elkhorn River near Waterloo could be developed as a hiking trail. A Mormon campsite and the Elkhorn River crossing are in this segment.

(C) North Bend Segment - Between Ames and Rogers, a distance of 15 miles (24 km.), the route follows U. S. Highway 30. A marker one-quarter mile (.4 km.) east of the Ames post office identifies the Overland, Mormon, and Military Trails.

(D) Loup River Segment - This 32-mile (51-km.) segment, between Columbus and the Loup River ford, follows State Highway 22. There is potential for a hiking trail paralleling the route between Columbus and Genoa along a canal right-of-way. Similar potential exists in the vicinity of the Lake North and Babcock Recreation Areas, as well as along the Loup River where a cross-

Nebraska Game and Parks Commission

Potential hike-bike trails exist along the Loup Public Power Canal and similar irrigation canals paralleling the Mormon Trail.

Nebraska Game and Parks Commission

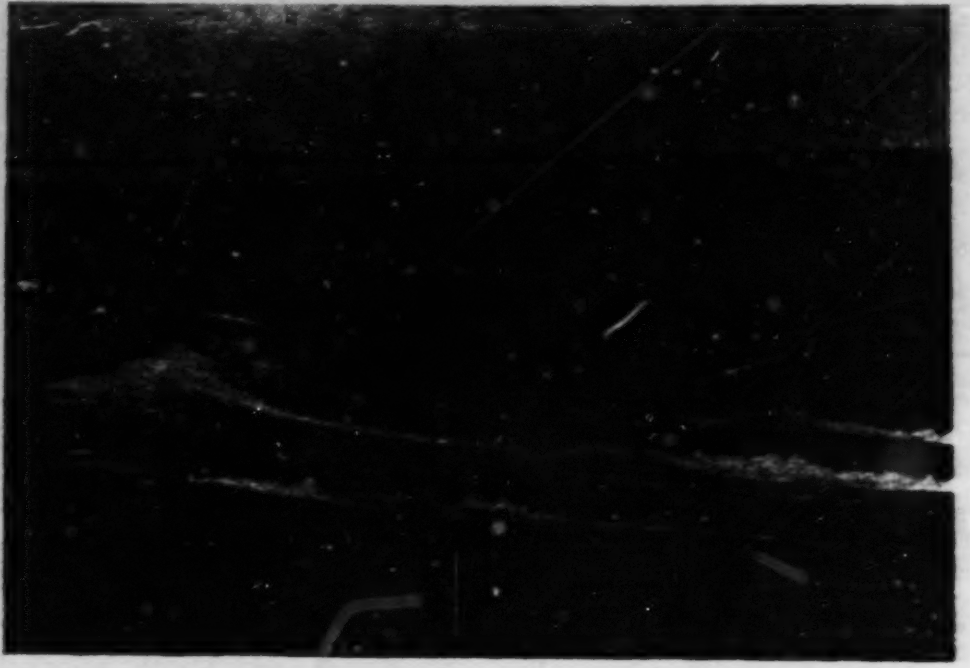
Recreation and scenic attractions combine with historical interpretation at Mormon Trail State Wayside Area in Merrick County, Nebraska.

country trail could be established. Important historic sites include Genoa, Pawnee Missionary Station, Government Indian Station, and the Loup River ford.

(E) Grand Island-Hall County Segment - Numerous historic points of interest and recreation areas are located along this 24-mile (39-km.) segment which follows the Wood River and the north channel of the Platte River between Grand Island and Shelton. Here U. S. Highway 30 and Interstate 80 closely parallel the route, providing public access to these sites and areas.

(F) Interstate 80 Segment - For 80 miles (129 km.) between Shelton and Gothenburg, the route follows Interstate 80 and the first Union Pacific trans-continental rail route along the north side of the Platte River. Mormon historic sites include seven campsites, the site of the first buffalo hunt, and the location of the first sighting of other white men along the trail. Two other important but non-Mormon sites are Fort Kearny (near the city of Kearney) and the Midway Stage and Pony Express Station.

(G) North Platte Segment - This 88-mile (142-km.) segment lies between Gothenburg on the Platte River and Lake McConaughy on the North Platte. It includes about 34 miles (55 km.) along Interstate 80, 40 miles (64 km.) of improved road, and 14 miles (923 km.) of cross-country trail. Notable



Nebraska Game and Parks Commission

Lake McConaughy provides a variety of recreation opportunities and is situated on the Mormon Trail.

historic sites in the corridor include Gilman's Station, Buffalo Bill State Historical Park, Fort McPherson National Cemetery, and O'Fallon Bluff. East of Lake McConaughy, 15 miles (24 km.) of the route follow minor roads and scenic canoe trails. The area between Sarben and Keystone offers views of the Platte River valley and has potential for development of a hiking trail.

(H) Scottsbluff Segment - Along this 118-mile (190-km.) portion of the route that parallels the North Platte River between Lake McConaughy and Scottsbluff is a total of 25 miles (40 km.) of potential cross-country trail. The remaining 93 miles (150 km.) follow State Highway 92 and U. S. Highway 26, a corridor common to the Mormon-Oregon Trails. Historic sites and recreation areas include nine Mormon campsites and numerous other places of importance such as the Diamond Springs Stage Station, Windlass Hill, Ancient Bluff Ruins, and Courthouse, Jail, and Chimney Rocks.

PUBLIC AGENCY INVOLVEMENT IN NEBRASKA

Approximately 70 percent of the trail in Nebraska is in private ownership. Much of the remaining 30 percent is on public lands along Federal and State highways and county roads.

Game and Parks Commission

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Less than 10 percent of the corridor is in Federal ownership, including the Scotts Bluff National Monument administered by the National Park Service. This 3,000-acre (1,214-hectare) area, which has visible Oregon Trail ruts, attracted over 174,000 visitors in 1975. The National Park Service also cooperates in the interpretive work of the Nebraska State Historical Society at Chimney Rock National Historic Site near Bayard. This area is jointly administered by the State Historical Society, the City of Bayard, and the National Park Service.

The Veterans Administration administers Fort McPherson National Cemetery, a popular attraction south of the Platte River near the town of Maxwell. The U. S. Fish and Wildlife Service administers 3 national wildlife refuges: DeSoto, North Platte, and Crescent Lake, all within 20 miles (32 km.) of the trail. These 3 areas, which total nearly 58,000 acres (23,472 ha.), received about 450,000 visitors in 1975.

The Nebraska State Historical Society plans and implements a statewide historic preservation policy and documents and coordinates the marking of historic sites. The society also operates several facilities, including two

Nebraska Game and Parks Commission

Between the Mormon Trail on the north and the Oregon Trail to the south lies the Platte River.

museums on Interstate 80 and one at Chimney Rock in addition to a schoolhouse museum at the Mud Springs Pony Express and Stage Station.

The Nebraska Department of Roads maintains a series of rest areas spaced at regular intervals along Interstate 80. The department also cooperates in developing facilities near highways and in placing and maintaining interpretive markers.

The Nebraska State Game and Parks Commission owns or manages more than 80 public parks, recreation, wayside, historic, and fish and wildlife areas, with a total of over 72,000 acres (29,138 ha.), along the trail. They attracted approximately 5 million visitors in 1975, including 150,000 visitors at Fort Kearny and Ash Hollow State Historic Parks.

The Nebraska SCORP,[2] prepared by the Nebraska Game and Parks Commission, specifically describes the routes and historic sites of the Oregon and Mormon Trails and stresses a continuing program for historic preservation and interpretation. The commission has been active in promoting a Bicentennial Trail System and working toward designation of the early emigration routes as part of the National Trails System.

Dr. Stanley B. Kimball

"Ancient Bluff Ruins," a landmark on the Mormon Trail, offers a potential for hiking trails and adjacent recreation development.

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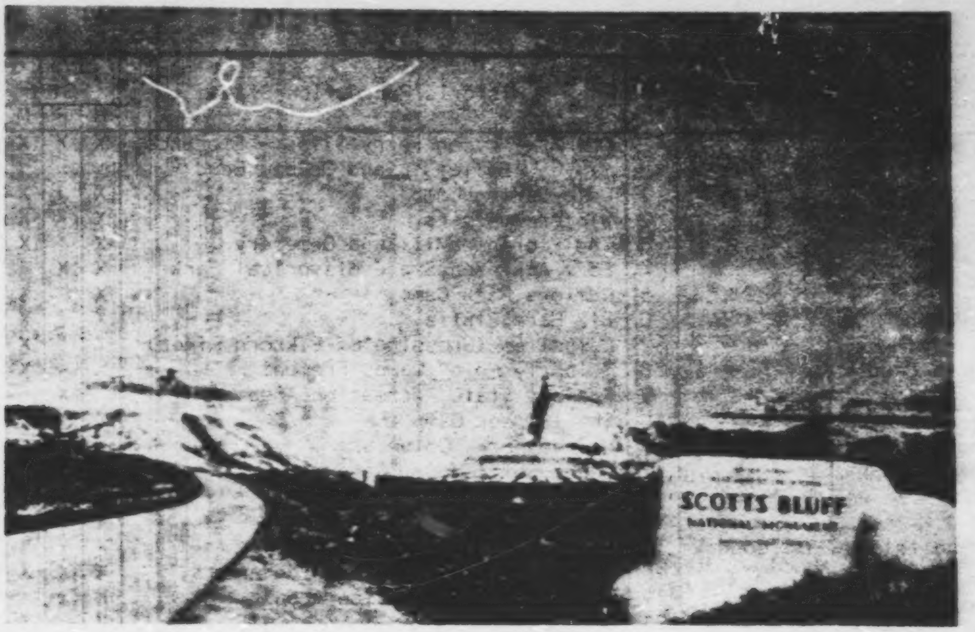
[2] *Nebraska State Comprehensive Outdoor Recreation Plan* (Nebraska Game and Parks Commission, 1973).



Dr. Stanley B. Kimbal

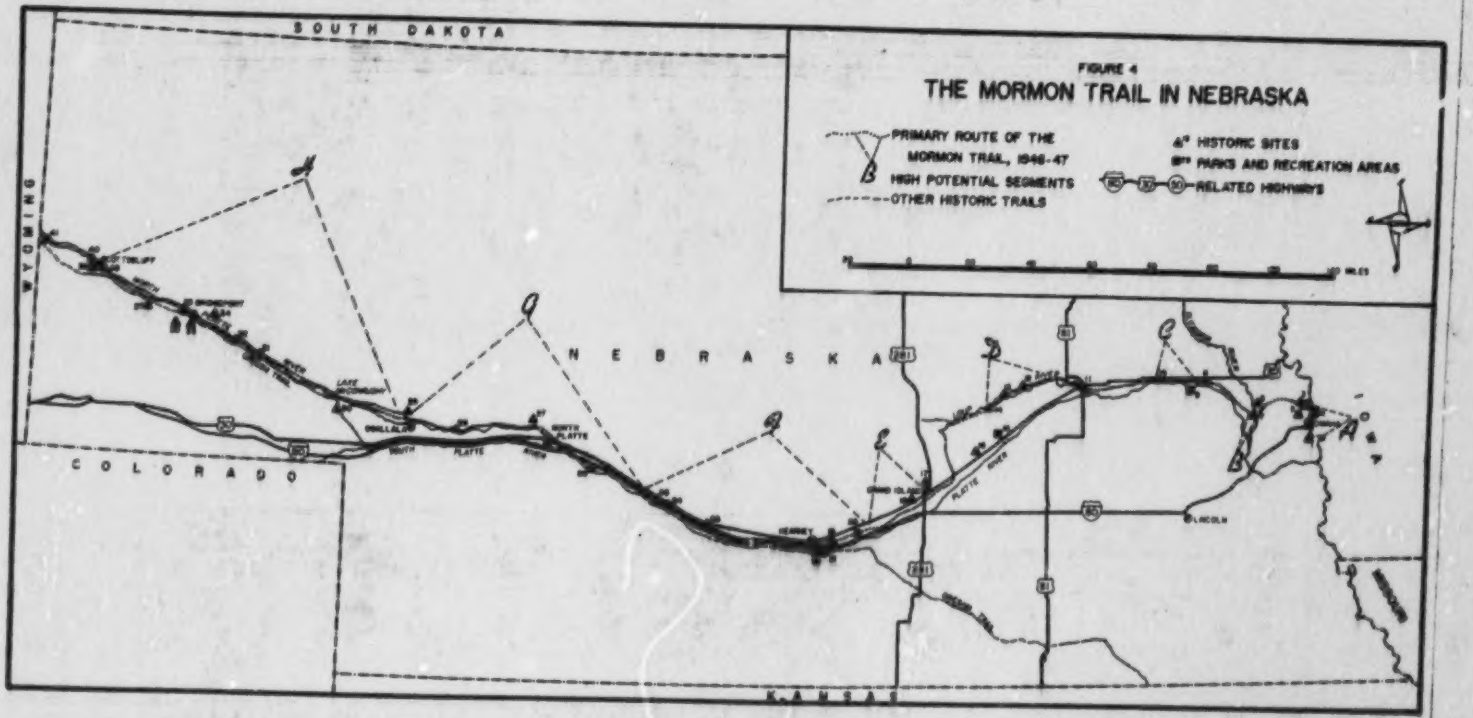
Brigham Young led the first group of Mormons past Scotts Bluff on the north side of the Platte River.

A portion of the Mormon Trail is the Bikecentennial Project of Columbus, Nebraska. Local and State action is progressing on the development of a hike-bike trail for approximately 25 miles (40 km.) along the Loup Power Canal which parallels the Mormon route between Columbus and Genoa, Nebraska.

TABLE 2 - NEBRASKA ROUTE SEGMENTS AND SITES[1]

Ref.	High-Potential Segments	Ref.	Historic/Recreation Sites	Type of Site[2]			
				H	R	M	O
A	Greater Omaha		OMAHA - Mormon Ferry Sites - Florence, Bellevue, and DeSoto Bend	X	X	X	
		1	Cold Spring Camp	X		X	
		2	Winter Quarters	X		X	
		3	The Florence Mill and Cemetery	X		X	
		4	Fort Atkinson State Historical Park	X	X		
		5	Cutlers Park Camp	X		X	
B	Elkhorn River	6	Elk Horn Bluffs	X		X	
		7	Campsites (Crossing of Elkhorn River)	X		X	
C	North Bend	8	"Liberty Pole" Camp, Fremont	X		X	
		9	Fremont State Recreation Area		X		
		10	Shell Creek Camp	X		X	
D	Loup River	11	Pawnee Park, Columbus	X		X	
		12	Genoa Settlement, Genoa	X		X	
		13	Loup River Ford, Fullerton	X		X	
		14	Loup River Camp	X		X	
E	Grand Island-Hall County	17	Stuhr Museum	X		X	X
		18	Mormon Island State Wayside Area	X	X	X	
F	Interstate 80	19	Windmill State Wayside Area	X	X	X	X
		20	Wood River Camp	X		X	
		21	Kearney County-State Recreation Area		X		
		22	Fort Kearny State Historical Park	X			X
			KEARNEY	X		X	X
		23	100th Meridian	X			X
		24	Mormon Camp	X		X	
		25	Willow Island Camp	X	X	X	
G	North Platte	26	Fort McPherson National Cemetery	X			
		27	Buffalo Bill State Historic Park	X	X		
		28	Sand Hills Camp	X		X	
H	Scottsbluff		LAKE McCONAUGHY		X		
		29	Lake Ogallala and Lake McConaughy State Recreation Area		X	X	
		30	Ash Hollow State Historic Park and Bluewater Overlook	X	X	X	X
		31	Indian "Lookout Point"	X		X	
		32	Ancient Bluff Ruins and Campsite	X		X	
		33	Bridgeport State Recreation Area	X	X	X	X
		34	Mormon Pioneer Campground	X		X	
		35	City Pioneer Trails Museum, Bridgeport	X			
		36	Courthouse and Jail Rocks	X			X
		37	Chimney Rock National Historic Site	X		X	X
		38	Rebecca Winters Grave	X		X	
			SCOTTSBLUFF				
		39	Scotts Bluff National Monument	X	X		
		40	Scotts Bluff Camp	X		X	
	Other Segments	15	Mormon Trail State Wayside Area (I-80)	X	X	X	
		16	Lone Tree Camp	X		X	
		41	Steamboat Rock Camp	X		X	

[1] All segments and sites are keyed to figure 4.
[2] Site designations are indicated as: H-Historic Sites; R-Recreation Sites; M-Mormon Trail Sites; O-Oregon Trail Sites.


SOUTH DAKOTA
WYOMING
COLORADO
NEBRASKA
KANSAS
IOWA
MISSOURI
PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HIGH POTENTIAL SEGMENTS
OTHER HISTORIC TRAILS
HISTORIC SITES
PARKS AND RECREATION AREAS
RELATED HIGHWAYS
MILES
LAKE MCCONAUGHY
OGALLALA
NORTH PLATTE
SOUTH PLATTE RIVER
KEARNEY
GRAND ISLAND
PLATTE RIVER
LINCOLN
OREGON TRAIL
80
30
281
81
A
B
C
D
E
F
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H

FIGURE 4
THE MORMON TRAIL IN NEBRASKA

THE TRAIL IN WYOMING

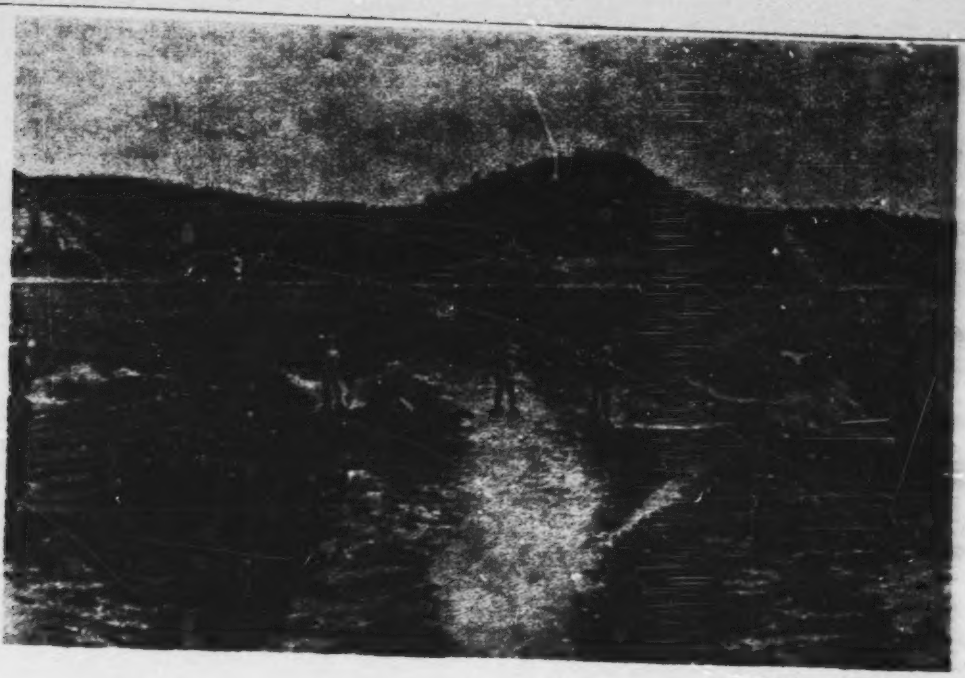
After traveling over 765 miles (1,231 km.) from Nauvoo, the Mormons reached Old Fort Laramie on May 31, 1847. About two months had elapsed since they left Winter Quarters on the Missouri River. The emigrants were weary of the seemingly endless Platte River Valley, but they were in better health than when they left Winter Quarters. Their only casualty was the loss of four horses.

Beyond Fort Laramie they crossed the North Platte River, joining other emigrants who were traveling the Oregon-California Trail through Wyoming. Upon reaching the Green River, they built rafts and ferried their wagons across. About 2 miles (3 km.) beyond Fort Bridger, Oregon-bound emigrants turned to the northwest, and the Mormons followed the faint trace of Hastings Cutoff or Donner Party Trail. This route led them southwest over the 7,700-foot (2,347-meter) Bear River Divide to Echo Canyon Creek just west of the Wyoming-Utah State line and into the Great Salt Lake Basin.

The Wyoming portion of the trail is approximately 450 miles (724 km.) long and is still visible across many miles of Wyoming rangeland. It crosses some of the most remote and least developed country along the entire route. The first one-third of the route through Wyoming follows the semiarid,

Wyoming Travel Commission

Fort Laramie, on the Laramie and North Platte Rivers, stood as the last major outpost for pioneers on their great migration west.



Wyoming Travel Commission

Glendo Reservoir on the Oregon-Mormon Trail is a major water sports area.

open, and generally flat valley of the North Platte River. The portion of the route between Guernsey and Glendo, however, passes through the narrow valleys in which the Bureau of Reclamation's Guernsey and Glendo Reservoirs are located.

West of Casper the trail traverses open, rolling sagebrush country to South Pass (elevation 7,650 feet [2,332 m.]), a low and barely distinguishable crossing of the Continental Divide. From here the route passes through desert country between Farson and Fort Bridger to the Utah State line.

Today about 95 percent of the land along the trail through Wyoming is used for agriculture and grazing.

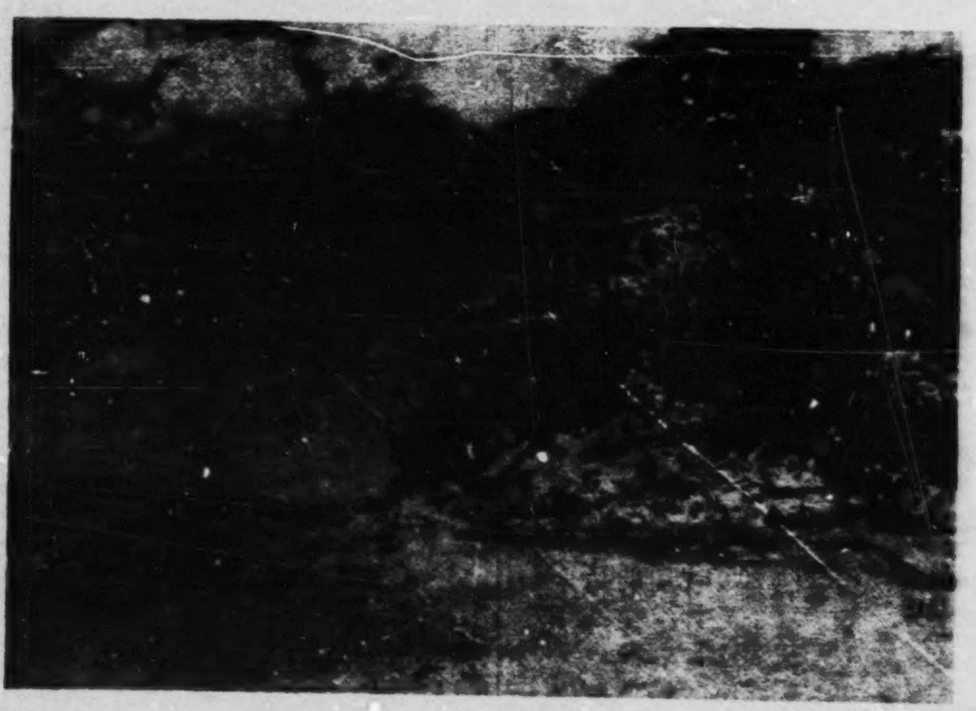
HIGH-POTENTIAL ROUTE SEGMENTS

Fourteen segments totaling 285 miles (459 km.) have high potential for public recreation use. Five segments contain a combination of highway, road, and/or cross-country access; nine sections have road access only.

Of 65 historic sites identified, approximately 40 have potential for public recreation use, as listed by segment in table 3 and shown in figure 5 at the end of this chapter.

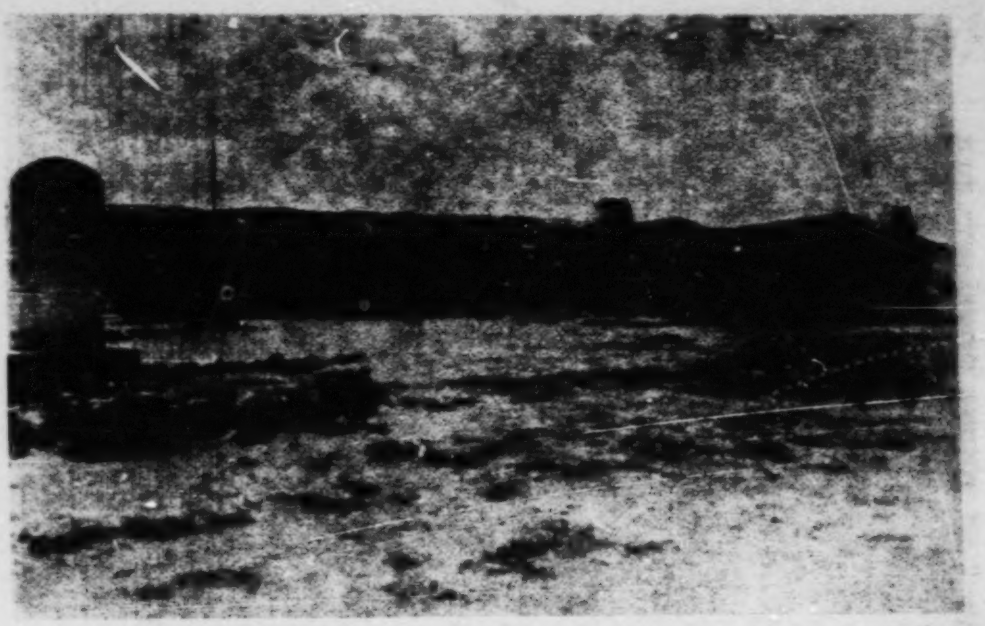
Approximately 20 miles (32 km.) of trail in Wyoming that have high potential for public recreation use are along highways. About 240 miles (386 km.) follow primitive and secondary roads, while approximately 25 miles (40 km.) are cross country. Along highway segments the primary potential is for auto travel, with secondary potential for development of hike and bike trails. Along road sections the potential would be for hike, bike, and horse trails, while the remaining segments offer cross-country hiking possibilities. A discussion of these segments and their related historic sites follows, with each keyed by letters in parentheses to figure 5.

(A) Fort Laramie Segment - This 15-mile (24-km.) segment, which includes 5 miles of highway and 10 miles (16 km.) of cross-country route, lies between Fort Laramie and Register Cliff/Guernsey State Park. The Mormons established a crossing to the south side of the North Platte River to reach Fort Laramie and opened a new route to Warm Springs. From here to the Green River crossing, the Mormon and Oregon Trails coincide for approximately 335 miles (539 km.). There are a number of other historic sites along this section, including Register Cliff, Cold Springs Rifle Pits Warm Springs Campsite, and wagon ruts near Guernsey.



Wyoming Travel Commission

Register Cliff, a State Park and National Historic place near Guernsey, Wyoming, contains hundreds of names carved by fur traders and emigrants, and bears dates as early as 1820.



Wyoming Travel Commission

Originally named Platte Bridge Station, Fort Caspar was the site of the famed Mormon Ferry.

(B) Laramie Peak Segment - Following unimproved roads between Wendover and Glendo Reservoir, this 14-mile (23-km.) section has potential for use as a hiking trail. Laramie Peak and Porters Rock are two notable features, as is Glendo Reservoir State Park.

(C) Oregon Trail Segment - Just south of Douglas, Wyoming, this 10-mile (16-km.) portion of the trail follows primitive roads and passes 2 Oregon Trail monuments. Other historic sites are Hot Springs, Old Camp Marshall, Bill Hooker's Cabin, and the LaBonte Station.

(D) Ayers Natural Bridge Segment - Ayers Natural Bridge, a well-known Mormon and Oregon Trail landmark, is reached by a paved road from Interstate 25. Included in this 6-mile (10-km.) segment are 4 road miles (6 km.) and 2 cross-country miles (3 km.). Other historic sites include the Hembre-Baker Graves and LaPrele Station.

(E) Mormon Canyon Segment - As part of their historic journey across Wyoming, Mormon groups wintered here in the 1850's. The graded road along this 8-mile (13-km.) portion in Mormon Canyon south of Glenrock has potential for a scenic hiking trail.

(F) Fort Caspar Segment - This 15-mile (24-km.) segment begins at historic Camp Caspar and follows a paved road west to Emigrant Gap. Fort Caspar was

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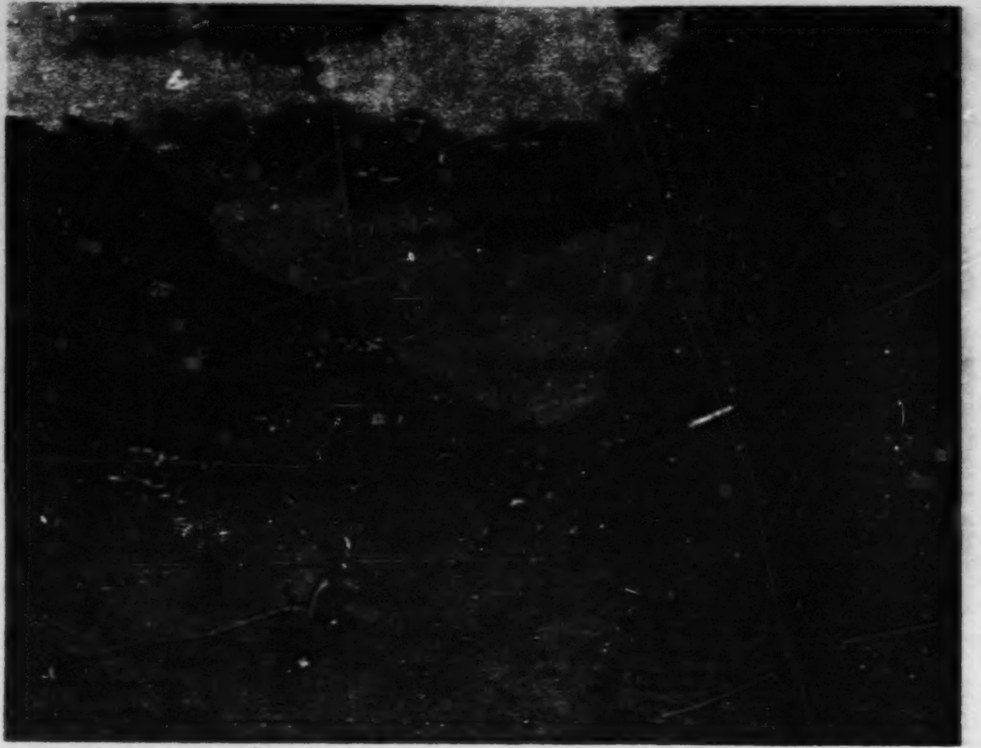

Wyoming Travel Commission

The still headwaters of Alcova Reservoir now fill Fremont Canyon where Lt. John C. Fremont attempted to float "bullboats" through raging waters of the North Platte River in 1842.

a military outpost that was restored in the 1930's and is now operated by the City of Casper as a tourist attraction. The most notable crossing of the North Platte was on the outskirts of the present city of Casper. A pioneer company of Mormons established a ferry here in 1847 and continued seasonal service for many years.

(G) Oregon Trail Road Segment - Between Emigrant Gap and Independence Rock, a distance of 40 miles (64 km.), the trail closely follows graded roads. Important historic sites include Poison Spring, Willow Spring, Avenue of Rocks, and Sweetwater Station. Portions of the trail pass close to Alcova Reservoir State Park and touch on the Sweetwater River arm of the Bureau of Reclamation's Pathfinder Reservoir.

(H) Independence Rock Segment - This historic 10-mile (16-km.) segment lies between Independence Rock and Martin's Cove on the Sweetwater River. It includes 4 miles (6 km.) of highway, 3 miles (5 km.) along roads, and 3 miles (5 km.) of cross-country trail. Independence Rock, the site of a proposed

State historical park, derived its name from celebrations held here beginning July 4, 1830.[1] Beyond Independence Rock the Sweetwater River funnels through the "Devil's Gate." Nearby, "Martin's Cove" is the site of the Mormon Handcart Disaster. Over 500 Mormons attempted to find refuge here from an early snowstorm in October 1856.

(I) Split Rock Segment - Between Split Rock and Jeffrey City, some 15 miles (24 km.), the trail includes 2 highway miles (3 km.), 6 miles (10 km.) along an unimproved road, and 7 cross-country miles (11 km.) on the south side of the Sweetwater River. Split Rock and Castle Rock were landmarks well known to the emigrants. Trail ruts have been permanently etched in the surface of nearby rock.

(J) Sweetwater River-South Pass Segment - This 60-mile (97-km.) segment is one of the most remote and untouched portions of the trail which still remains visible for many miles. It follows county and unimproved roads near the Sweetwater River, primarily through public domain lands. The segment begins east of Sweetwater Station (U. S. Highway 287) and ends near State Highway 28 at South Pass. Willie's Company Cemetery is one of several historic sites along the route where another 1856 Mormon handcart disaster occurred.

Utah Tourist and Publicity Council

In later years of the emigration, handcart brigades were used as a means of moving larger numbers of Mormons at less cost and time.

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[1] *"At Noon We Reached Independence Rock"* (Wyoming Bicentennial Commission and Wyoming Recreation Commission, November 30, 1973).

Wyoming Travel Commission

Church Butte landmark was a popular Mormon stopping place west of the Green River

(K) Little Sandy Segment - Primitive roads provide access along this 15-mile (24-km.) segment. Between South Pass west of Little Sandy Crossing the Mormons met with the famous trapper and guide, Jim Bridger, to discuss their route. The trail passes the Pacific Springs Campsite and "Parting-of-the-Ways," a junction with the Sublette Cutoff to Oregon Territory.

(L) Mormon Knolls-Green River Segment - Beginning at Farson, this 25-mile (40-km.) section follows unimproved roads and ends at the Mormon ferry crossing of the Green River. It passes Simson Gulch, site of the Mormon burning of a United States supply train during the "Utah War" of 1857, and Mormon Knolls.

(M) Church Butte Segment - This 25-mile (40-km.) segment lies between Granger and the Church Butte and Names Rock landmarks, 6 miles (10 km.) east of Fort Bridger. The trail follows 17 miles (27 km.) of primitive roads and 8 miles (13 km.) of Interstate 80. A historic stage station site is located at Granger.

(N) Piedmont-Needles Segment - For a distance of 26 miles (42 km.) from the Piedmont Charcoal Kilns site southwest of Fort Bridger, the trail follows unimproved roads. After crossing the Bear River, it follows Coyote Creek to the Needles landmark at the Wyoming-Utah border, then continues into Utah and ends at Castle Rock on Interstate 80.

PUBLIC AGENCY INVOLVEMENT IN WYOMING

More than 60 percent of the land along the route in Wyoming is publicly owned, with about half under the administration of the Bureau of Land Management (BLM). The Bureau is classifying its lands according to optimum use and is identifying lands primarily of value for recreation. The Mormon and Oregon Trail routes are being incorporated into management plans. Management policy for preservation and administration of historic remnants is being formulated.

BLM lands contain many of the high-potential recreation segments, visible route segments, and significant historic sites. A great opportunity exists for providing miles of interpretive and recreation trails at relatively low cost.

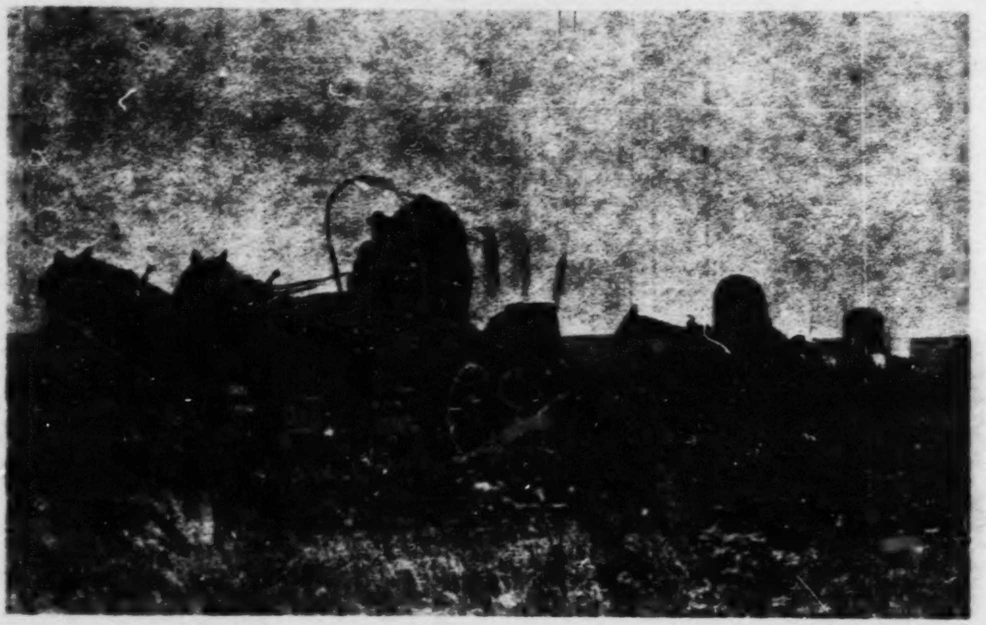
Utah State Historical Society

An emigrant train in the Rocky Mountains.
From an engraving by F. F. Palmer, 1856

Along the corridor followed by the Oregon and Mormon Trails, wayside interpretive exhibits, including trail markers, have been constructed to commemorate the Nation's Bicentennial. These include Bessemer Bend with its 50-mile (80-km.) canoe trail, Devil's Gate, Martins Cove, Split Rock, and South Pass on the Continental Divide. The BLM is pursuing a program of acquiring lands with historic trail remains through an exchange program. The agency also cooperates with Wyoming historical societies in marking and protecting historic sites and trail segments.

Fort Laramie National Historic Site is administered by the National Park Service. The fort provided protection from Indians and served as a center for exchanging news and trail information, making repairs, and trading goods. Restoration of this famous site with its historical museum is nearing completion.

The Wyoming Recreation Commission administers six recreation areas and numerous historic sites along the Oregon-Mormon Trail, including State parks at the Bureau of Reclamation's Guernsey and Glendo Reservoirs. Tourist promotion of these areas is handled by the Wyoming Travel Commission. There are developed interpretive trails at Register Cliff and near Guernsey, with potential for a trail along the Mormon route at Warm Springs Canyon. Also, plans are being made for a new State historic park at Independence Rock.



Wyoming Travel Commission

Reenactment of a pioneer wagon trek in Wyoming. Similar junkets have become annual affairs in the State, such as the Jim Bridger Wagon Train from Evanston to Fort Bridger.

The Wyoming State Archives and Historical Department is responsible for the collection, preservation, display, and interpretation of materials illustrative of the history and development of the State. The Museums Division operates the State Museum in Cheyenne and branch museums at Guernsey State Park, Fort Fetterman, South Pass City, and Fort Bridger. Fort Bridger has particular historic significance to the Mormon Trail, and extensive interpretation is being carried out by the State at this site.

Major portions of the trail through the State are followed closely by public roads maintained by the Wyoming Highway Department. The department develops wayside rest areas, places interpretive signs and facilities along highways, and cooperates with the Recreation Commission in preserving historic sites affected by highway construction.

Private organizations actively concerned with historic preservation include the Wyoming State Historical Society and the Wyoming Archeological Society. In addition, the Sons and Daughters of the American Revolution have been erecting monuments along historic trails in the State since 1894.

Historical and recreation areas along the trail corridor attracted approximately 425,000 visitors in 1975.

TABLE 3 - WYOMING ROUTE SEGMENTS AND SITES[1]

Ref.	High-Potential Segments	Ref.	Historic/Recreation Sites	Type of Site[2]			
				H	R	M	O
A	Fort Laramie		FORT LARAMIE NATIONAL HISTORIC SITE	X		X	X
		1	Crossing of North Platte River	X		X	
		2	Register Cliff Camp	X		X	X
		3	Oregon-Mormon Trail Ruts	X		X	X
		4	Warm Springs Canyon Trail	X		X	
B	Laramie Peak	5	Guernsey State Park	X	X	X	X
		6	Glendo State Park		X		
C	Oregon Trail		(Oregon Trail Route)	X			X
D	Ayers Natural Bridge	7	Ayers Natural Bridge Camp	X	X	X	
E	Mormon Canyon	8	Mormon Canyon	X	X	X	
F	Fort Caspar		CASPER				
		9	Fort Caspar	X		X	X
		10	Mormon Ferry	X		X	
G	Oregon Trail Road	11	Emigrant Gap	X		X	X
		12	Poison Springs Camp	X		X	X
		13	Rock Avenue	X		X	X
		14	Ryan Hill	X		X	
		15	Alcova State Park		X		
		16	Pathfinder Reservoir	X	X		
H	Independence Rock		INDEPENDENCE ROCK	X		X	X
		17	Devil's Gate Camp	X		X	X
		18	Martin's Cove - Mormon Handcart Disaster	X		X	
I	Split Rock	19	Split Rock Station	X		X	X
		20	Ice Slough	X		X	X
J	Sweetwater River-South Pass	21	Mormon Cemetery - Willie's Company	X		X	
		22	Mormon Mail Station	X		X	
		23	South Pass City	X			X
		24	South Pass Summit Monuments - Continental Divide	X		X	X
		25	Pacific Springs	X			
K	Little Sandy	26	Parting of the Ways	X			X
		27	Dry Sandy Creek Camp	X		X	
L	Mormon Knolls-Green River	28	Crossing of Big Sandy Camp	X		X	
		29	Simson Gulch	X		X	
		30	Mormon Knolls	X		X	
		31	Green River - Mormon Ferry	X		X	
M	Church Butte	32	Church Butte	X		X	X
N	Piedmont-Needles	33	Mormon Camp Bear Town - Bear River Crossing	X		X	
		34	The Needles - Coyote Creek Camp Site	X		X	
	Other Segments		FORT BRIDGER	X		X	X

[1] All segments and sites are keyed to figure 5.

[2] Site designations are indicated as: H-Historic Sites; R-Recreation Sites; M-Mormon Trail Sites; O-Oregon Trail Sites.

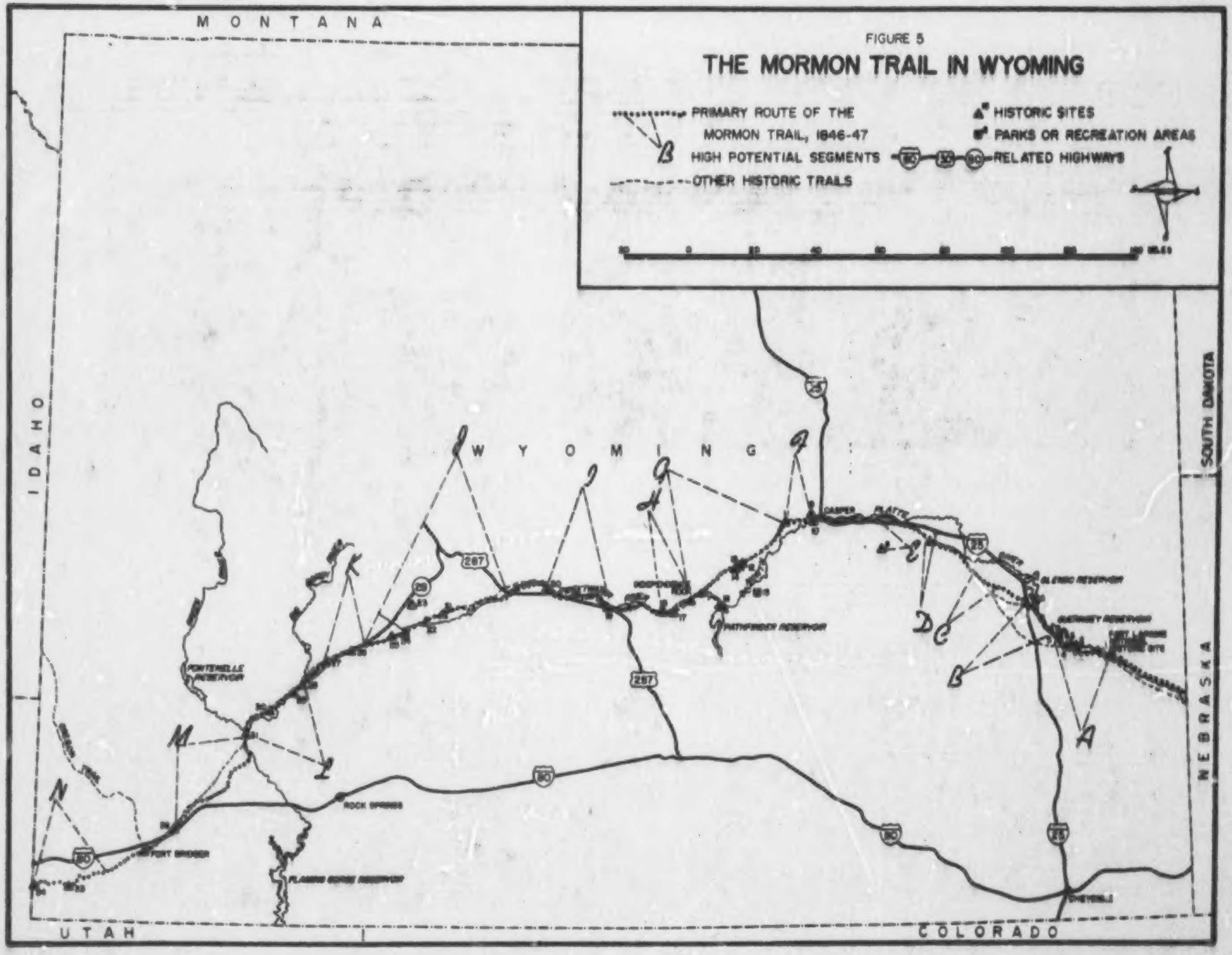


FIGURE 5

THE MORMON TRAIL IN WYOMING

PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HIGH POTENTIAL SEGMENTS
OTHER HISTORIC TRAILS
HISTORIC SITES
PARKS OR RECREATION AREAS
RELATED HIGHWAYS
80
30
90
MONTANA
IDAHO
UTAH
COLORADO
NEBRASKA
SOUTH DAKOTA
WYOMING
CASPER
PLATTE
GLENDO RESERVOIR
GUERNSEY RESERVOIR
FORT LARAMIE NATIONAL HISTORIC SITE
PATHFINDER RESERVOIR
FONTENELLE RESERVOIR
ROCK SPRINGS
FORT BRIDGER
FLAMING GORGE RESERVOIR
CHEYENNE
287
25
28
A
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THE TRAIL IN UTAH

By the time they entered Utah, the Mormons had traveled more than 1,200 miles (1,931 km.) and were only a short distance from their goal - the Great Salt Lake Valley. Some of the most difficult but scenic trail was encountered in the last leg of their journey.

After proceeding down precipitous Echo Canyon, now traversed by Interstate 80, they passed through the rugged Wasatch Mountains, following East Canyon, Little Emigration Canyon, and 7,420-foot (2,262-m.) Big Mountain Pass. They then descended the steepest slope on the trail and traveled through narrow and winding Emigration Canyon, thereby establishing a direct route to Salt Lake City. It is generally accepted, however, that the trail terminates at the canyon's mouth where today Brigham Young's renowned "This is the Place" statement is commemorated in Pioneer Trail State Park.

Dr. Stanley B. Kimball

The summit of Big Mountain Pass provided the first view of the Salt Lake Valley to the emigrants on the Mormon Trail.

Currently about 45 percent of the land along the trail is used for agriculture and grazing, 3 percent for residential development, and 52 percent for highway right-of-way. Topography varies from rolling, grass- and brush-covered hills to arid canyons incised in the forested mountains east of Salt Lake Valley.

HIGH-POTENTIAL ROUTE SEGMENTS

Within the 70-mile-long (113-km.) trail corridor through Utah, there are 2 segments totaling 50 miles (80 km.) that have high potential for recreation development and interpretation. There are about 30 significant historic sites along the trail corridor, as listed by segment in table 4 and shown on figure 6 at the end of this chapter. Sixteen historical markers are in place, but there has been little other interpretive development.

Thirty-two (51 km.) of the 50 miles (80 km.) of the trail with high potential follow highways, 5 miles (8 km.) follow primitive roads, and 13 miles (21 km.) follow short cross-country stretches. Along highway portions, the primary potential is for auto travel; however, there is an additional potential for parallel hike and bike trails. Primitive roads could be utilized for hike or horse trails, whereas cross-country sections could be used for hiking. High-potential trail segments are discussed below, with each keyed by letters in parentheses to figure 6.

(A) Cache Cave/Castle Rock Segment - This 10-mile (16-km.) segment is a continuation of the Piedmont-Needles segment in Wyoming and contains 5 miles (8 km.) of primitive roads and 5 miles (8 km.) of cross-country trail. Six miles (10 km.) west of the Wyoming border the trail reaches the first notable historic site - Cache Cave, a large natural opening in a yellow sandstone ledge, which is a major landmark on the Mormon Trail. It was used as a rendezvous and sheltering place by the pre-1840 trappers and explorers, and by Mormon parties starting in 1847. Five miles (8 km.) from Cache Cave is 200-foot-high (61-m.) Castle Rock located in Echo Canyon and recorded as a Mormon campsite. This rounded bluff contains a large cave entering its southeast face that was the scene of early-day coal mining operations.

(B) Henefer to "This is the Place" Segment - This 40-mile (64-km.) section is composed of 32 miles (51 km.) of highway and 8 miles (13 km.) of cross-country trail. A 33-acre (13-ha.) park will be developed at Henefer by Utah's Division of Parks and Recreation to commemorate the Mormon journey.

Dr. Stanley B. Kimball

West of Castle Rock campsite sheer sandstone cliffs rise 150 feet (46 m.) above the trail.

About 4 miles (6 km.) west of Henefer, the Lone Tree Mormon campsite is marked by a monument.

From here the route crosses a rolling plateau where wagon ruts may be seen. East Canyon Lake and Rockport Lake State Recreation Areas are in the middle of this segment, and the forested Wasatch Mountains rise on either side. Other historic sites include Dixie Hollow Campsite and Pony Express Station, Bauchman's Pony Express Station, the Camp Clayton site, Mormon Flat, Camp Grant, and Big Mountain Pass.

"This is the Place" Monument, a dominant feature at the western terminus of the trail, is located in Pioneer Trail State Park at Emigration Canyon. This and other State recreation areas and historic sites along the trail corridor in Utah attracted over one million visitors in 1975.

PUBLIC AGENCY INVOLVEMENT IN UTAH

Approximately 40 miles (64 km.), or 57 percent, of the Utah route is on public land, virtually all of which is in highway right-of-way. The remaining 30 miles (48 km.) of the route is on private land

Dr. Stanley B. Kimball

The trail through Little Emigration Canyon from Mormon Flat to the summit of Big Mountain is much the same as it was when pioneer wagons pushed up the steep ascent.

Utah's Division of Parks and Recreation has marked several historic sites along the trail. This agency is in the process of acquiring and developing a segment of the Mormon Trail in Little Emigration Canyon. The State has planned a series of actions to provide historic and recreation opportunities along the last 36 miles (58 km.) of the Mormon Trail. The terminus, at Pioneer Trail State Park, will include the re-creation of a pioneer village as a living historical museum. An ox-cart trail will provide visitors a portrayal of the Mormon Trail and pioneer life. "This is the Place" Monument, together with part of Emigration Canyon, is a national historic landmark. The Utah Department of Transportation and the State Historical Society have assisted in these efforts.

Dr. Stanley B. Kimball

A monument at the last campsite of Brigham Young before entering the Salt Lake Valley marked the end of the steepest descent on the entire trail from Little Mountain to Emigration Canyon

The Utah State Comprehensive Outdoor Recreation Plan[1] cites the international significance of Mormon culture and history and specifically mentions the inclusion of the Mormon Pioneer Trail and a national system of historic trails.

The Church of Jesus Christ of Latter-day Saints has assisted the Division of Parks and Recreation, the State Historical Society, and other organizations by providing information, research, and encouragement for trail preservation, marking, and interpretation.

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[1] Utah Department of Natural Resources, *Outdoor Recreation in Utah* (April 1, 1973).

TABLE 4 - UTAH ROUTE SEGMENTS AND SITES[1]

Ref.	High-Potential Segments	Ref.	Historic/Recreation Sites	Type of Site[2]		
				H	R	M
A	Cache Cave-Castle Rock	1	Cache Cave	X		X
		2	Castle Rock	X		X
B	Henefer to "This is the Place"	5	Henefer Memorial State Park	X		X
			Lone Tree Campsite	X		X
			Hogsback Summit	X		X
			Dixie Hollow Springs Camp	X		X
			Dixie Hollow Pony Express Station	X		
		6	East Canyon Lake State Recreation Area		X	
		7	Pioneer Grant's Grave	X		X
			Bauchman's Pony Express Station	X		
			Dutch Hollow, Utah War Fortifications, ruins	X		X
		8	Camp Clayton	X		X
		9	Mormon Flat State Park	X		X
			Little Emigration Canyon and Mormon Fortifications	X		X
		10	Big Mountain Pass and Historical Marker	X		X
			Mountain Dell Reservoir	X	X	X
			Ephraim Hanks Pony Express Station	X		
			George Washington Grove	X	X	
		11	Camp Grant	X		X
			Little Mountain Summit	X		X
			Emigration Canyon	X		X
		12	Last Camp	X		X
			Donner Hill	X		X
		13	"This is the Place" Monument	X		X
		14	Pioneer Trail State Park	X	X	X
	Other Segments	3	Historic Marker and Visitor Center on Interstate 80 and U. S. Highway 30S			
		4	Echo Canyon Reservoir		X	
			Echo Canyon Mormon Fortifications	X		X
			Weber River Explorers Trail Monument	X		
			SALT LAKE CITY			
			Fort Douglas	X		
			Temple Square	X		X
			Seagull Monument	X		X
			Beehive House	X		X

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[1] All segments and sites are keyed to figure 6.

[2] Site designations are indicated as: H-Historic Sites; R-Recreation Sites; M-Mormon Trail Sites.

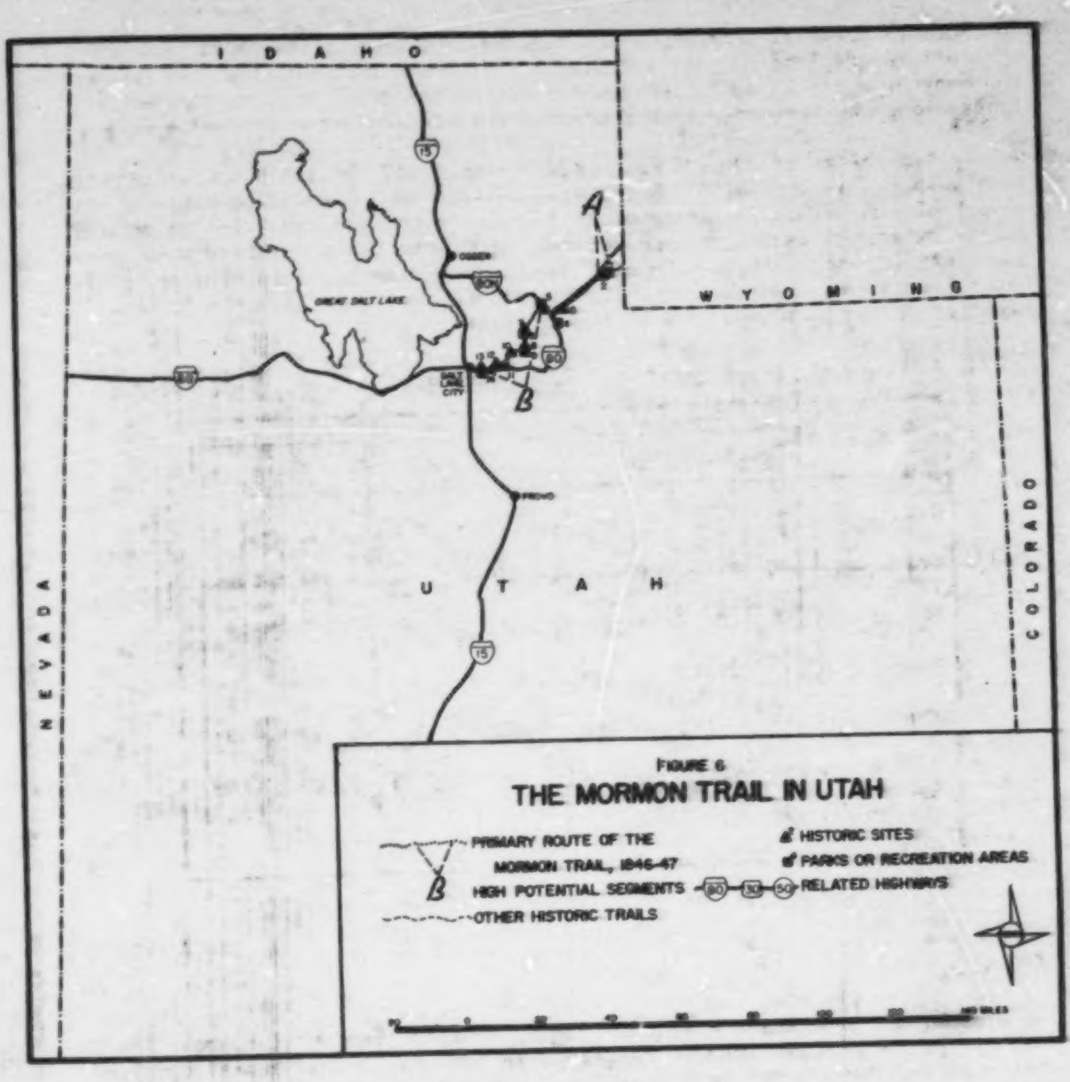
IDAHO
WYOMING
NEVADA
COLORADO
UTAH
GREAT SALT LAKE
OGDEN
SALT LAKE CITY
PROVO
15
80N
80
A
B
PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HIGH POTENTIAL SEGMENTS
OTHER HISTORIC TRAILS
HISTORIC SITES
PARKS OR RECREATION AREAS
80 30 50 RELATED HIGHWAYS
MILES

FIGURE 6

THE MORMON TRAIL IN UTAH

LAND OWNERSHIP AND USE

LAND OWNERSHIP

The Mormons traveled across what has become one of the most productive agricultural regions in the world. The rich farmlands of Iowa and eastern and central Nebraska were settled by homesteaders. Most of the semiarid lands along the western portions of the trail became large ranches.

Nearly two-thirds of the trail (822 miles [1,323 km.]) is now in private ownership. The remaining 478 miles (768 km.) are located on public land, about half of which is State-owned highway rights-of-way. The balance of public ownership is State and Federal, with the Bureau of Land Management administering most of the Federal land along the route in Wyoming. Land ownership patterns in each State along the route, shown in table 5, are not expected to change significantly in the future.

TABLE 5 - LAND OWNERSHIP

State	Ownership in Linear Miles (Km.)			
	Federal	State and Local	Private	Total
Illinois[1]	--	--	--	--
Iowa	0	10 (16)	275 (443)	285 (459)
Nebraska	50 (80)	95 (153)	345 (555)	490 (788)
Wyoming	213 (343)	70 (113)	170 (274)	453 (730)
Utah	1 (2)	39 (63)	32 (51)	72 (116)
TOTALS	264 (425)	214 (345)	822 (1,323)	1,300 (2,093)
PERCENT	20	16	64	100

[1] Point of departure (east bank of the Mississippi River at Nauvoo).

LAND USE

The predominant land use is agriculture, ranging from grains, row crops, hay, and pasture in the east to rangeland in the west. Residential development is primarily limited to a few urban areas.

Little commercial use is made of trees, such as ash, cottonwood, and willow, which grow along watercourses. Isolated stands of commercially valuable ponderosa pine and Douglas fir are found near the Continental Divide in Wyoming and throughout the Wasatch Mountains in Utah.

There are no foreseeable major shifts in land use with the possible exception of coal and oil development in Wyoming and eastern Utah. Although the Mormon route does not cross any sites of active mineral extraction, it does pass through areas containing deposits of oil shale, coal, phosphate, trona, and uranium.

TABLE 6 - LAND USE PATTERNS

State	Type of Land Use in Linear Miles (Km.)				
	Urban	Agriculture	Forest	Other[1]	Total
Illinois[2]	--	--	--	--	--
Iowa	19 (31)	254 (409)	10 (16)	2 (3)	285 (459)
Nebraska	34 (55)	445 (716)	8 (13)	3 (5)	490 (789)
Wyoming	22 (35)	417 (671)	6 (10)	8 (13)	453 (729)
Utah	8 (13)	45 (72)	19 (31)	--	72 (116)
TOTALS	83 (134)	1,161 (1,868)	43 (70)	13 (21)	1,300 (2,093)
PERCENT	6	90	3	1	100

[1] Recreation, commercial, and industrial use.
[2] Point of Departure (east bank of the Mississippi River at Nauvoo).

DEVELOPMENT OF THE TRAIL

Although much of the Mormon Trail does not possess the qualities necessary for designation as a national scenic trail and development as a continuous hiking trail, the historic importance of the route deserves national commemoration. Therefore, this report recommends that the route be designated as the Mormon Pioneer National Historic Trail and declared a component of the National Trails System. The report further recommends that the Secretary of the Interior utilize this expression of national interest to stimulate and assist Federal, State, local, and private interests in further planning and development of the high-potential route segments using existing Federal and State programs. Potential Federal assistance and funding sources include the much-expanded Land and Water Conservation Fund, Comprehensive Employee Training Act, Youth Conservation Corps, Adult Conservation Corps, and the program and funds for conversion of abandoned railroad rights-of-way to trails. With these programs, the recommendations contained in this report and using local ideas and initiatives as well, communities and organizations along the route have a unique opportunity to preserve historic sites and develop recreation areas for their own use and for the enjoyment of others visiting the Mormon Trail corridor.

The Mormon Pioneer Trail Foundation has established and coordinated trail development procedures among several of the States. It is essential that this mechanism continue to function effectively and be expanded to include all of the involved States. This group should form the nucleus of a volunteer organization encompassing a wide range of entities and individuals concerned with the overall coordination, historical preservation, and further development not only of the marked route, but also the high-potential, cross-country trail segments and other significant historical interpretation and recreational opportunities identified in this report.

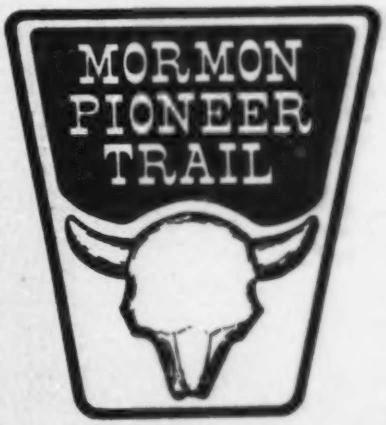

Figure 7

Mormon Pioneer Trail Symbol in Iowa.

As shown in figures 8, 9, and 10, a network of State and Federal highways closely follows the Mormon Trail route. To facilitate retracement of the historic route and connect the more than 90 historic sites and recreation areas between Nauvoo and Salt Lake City, markers would be erected along these public roads and highways. The suggested symbol, as shown in figure 7 (used with permission of the Mormon Pioneer Trail Foundation), can be found along roads in Iowa which intersect the route. In addition to directional signs, interpretive signs are recommended for placement along the route at existing public highway rest areas and road pull-off sites. The location of these interpretive signs should be determined by State agencies.

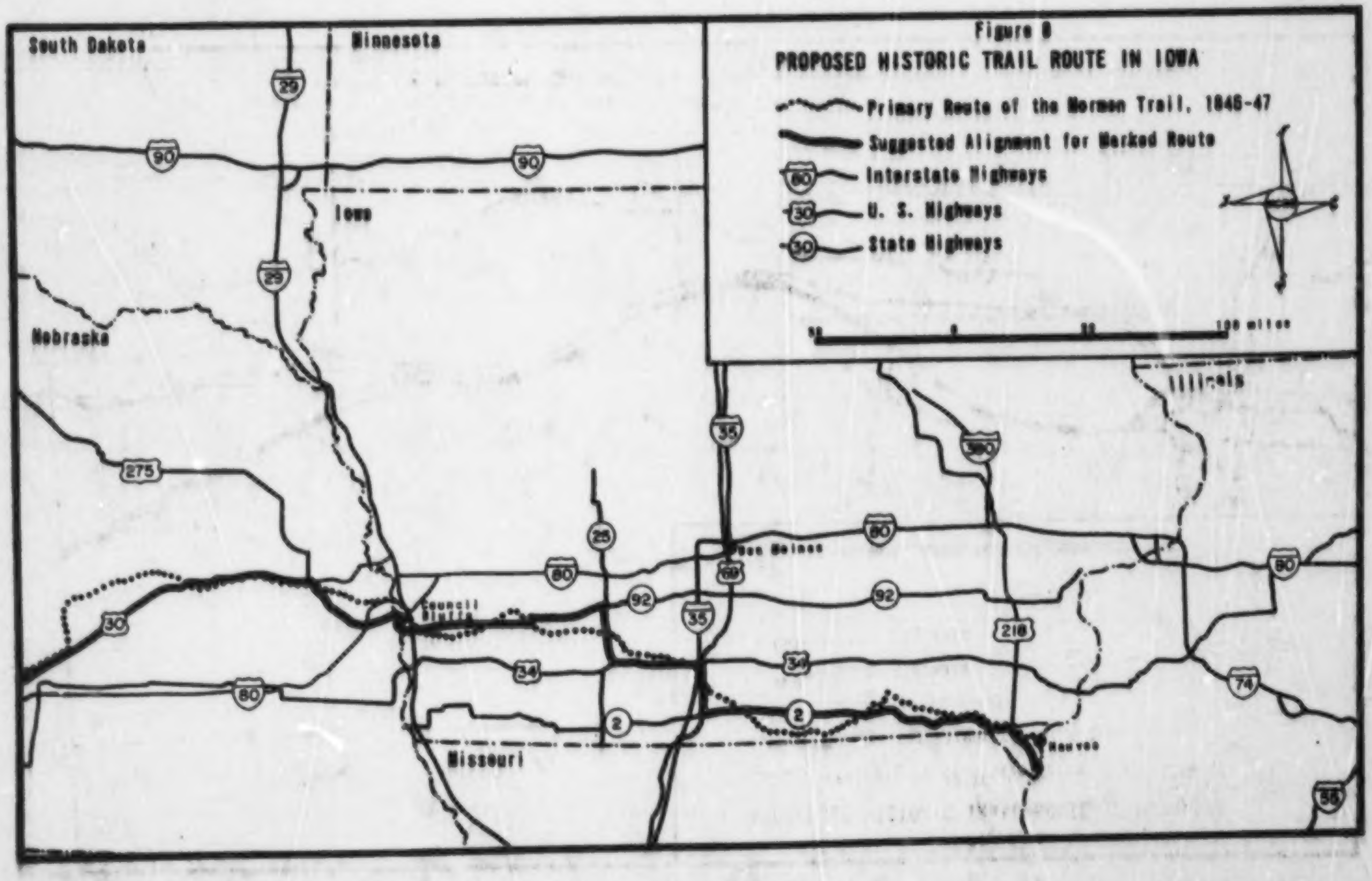

Figure 8

PROPOSED HISTORIC TRAIL ROUTE IN IOWA

Primary Route of the Mormon Trail, 1846-47
Suggested Alignment for Marked Route
80 Interstate Highways
30 U. S. Highways
30 State Highways
50
0
50
100 miles
South Dakota
Minnesota
Iowa
Nebraska
Illinois
Missouri
Council Bluffs
Des Moines
Nauvoo
29
90
275
30
80
34
2
25
92
35
69
380
218
74
55

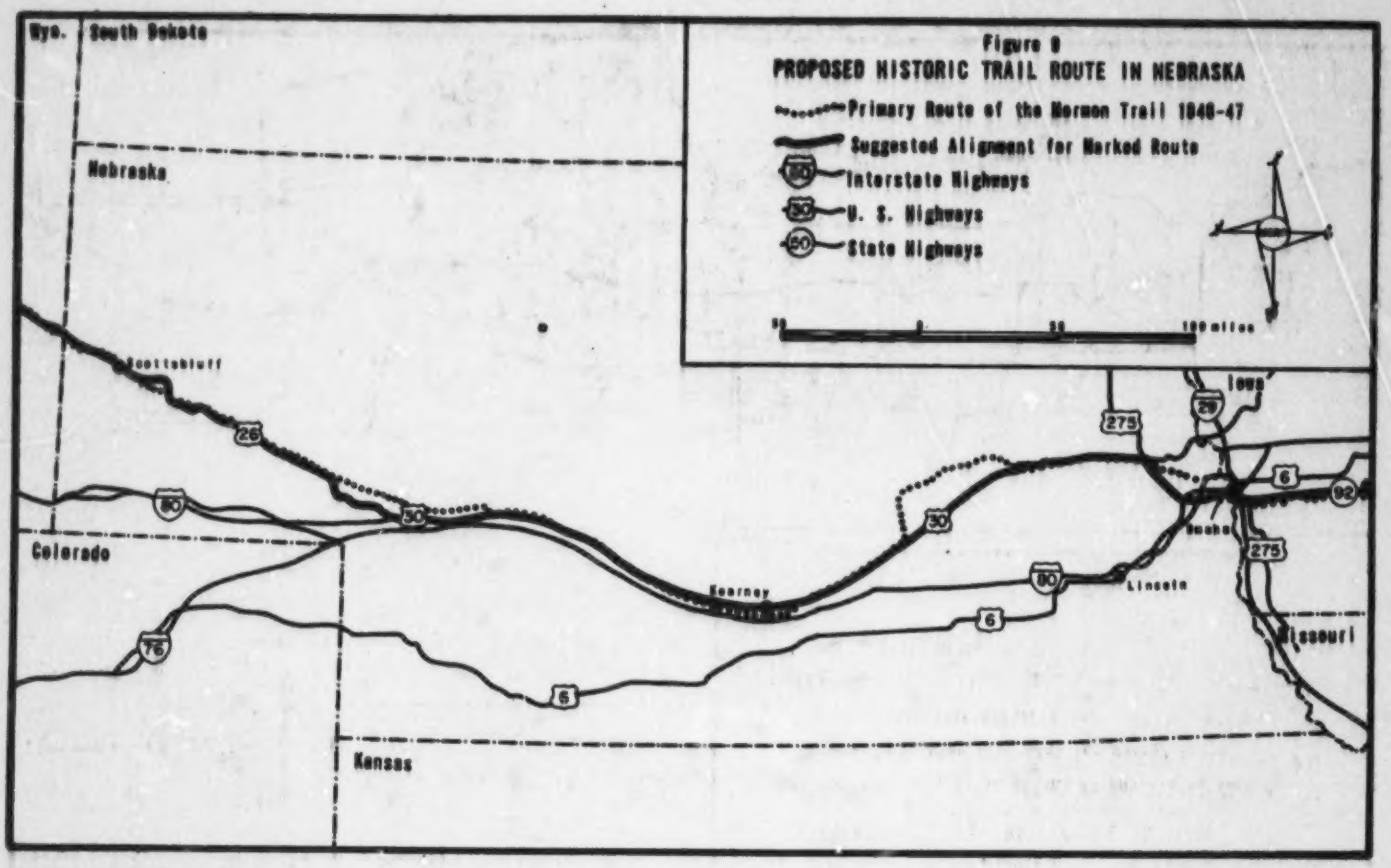

Figure 8
PROPOSED HISTORIC TRAIL ROUTE IN NEBRASKA

Primary Route of the Mormon Trail 1846-47
Suggested Alignment for Marked Route
80
Interstate Highways
30
U. S. Highways
50
State Highways
50
0
50
100 miles
Wyo.
South Dakota
Nebraska
Scottsbluff
26
80
30
Colorado
76
6
Kearney
6
80
30
275
29
Iowa
6
92
Omaha
275
Lincoln
Missouri
Kansas

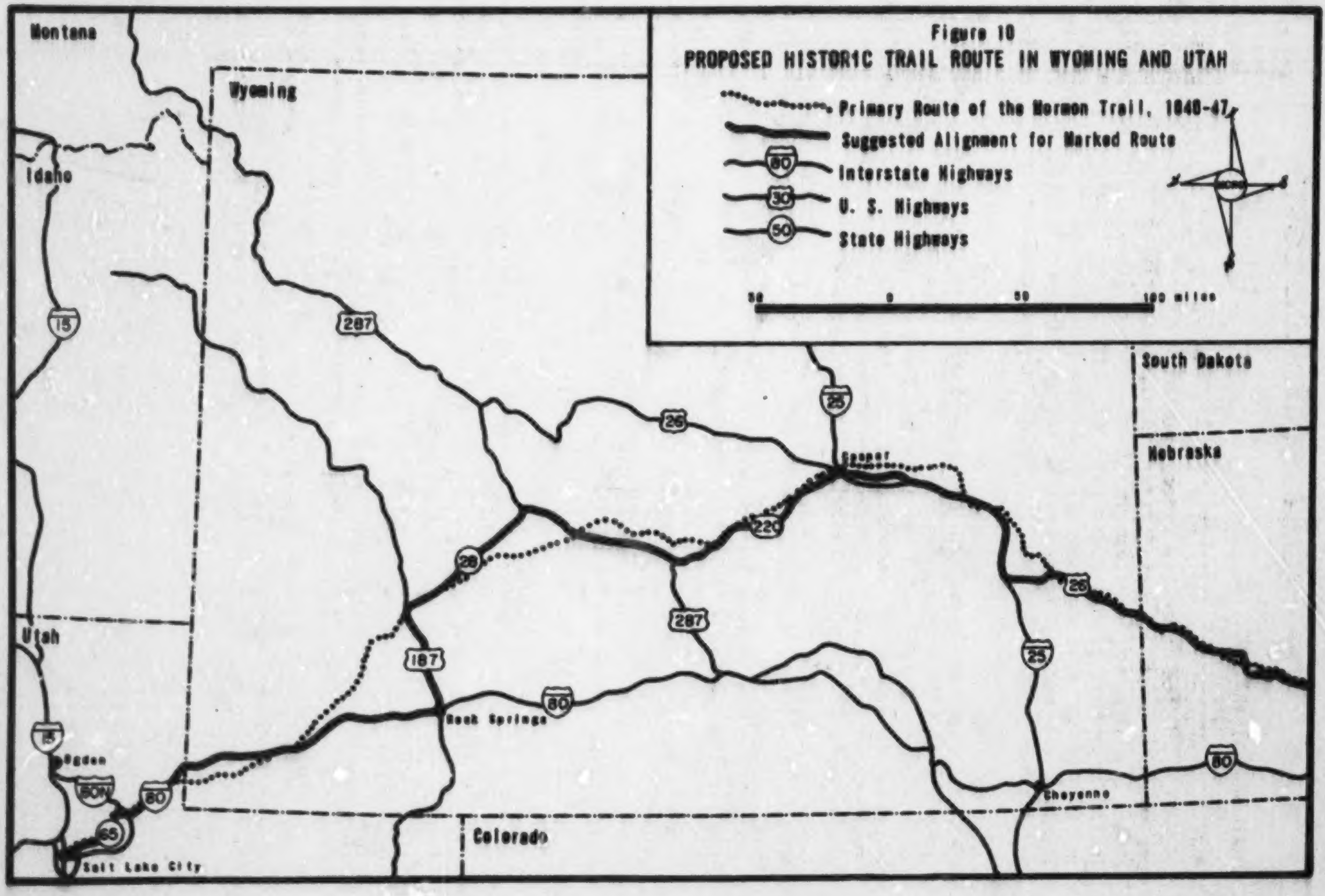
Primary Route of the Mormon Trail, 1846-47
Suggested Alignment for Marked Route
80
Interstate Highways
30
U. S. Highways
50
State Highways
50
0
50
100 miles
Montana
Wyoming
Idaho
Utah
South Dakota
Nebraska
Colorado
15
287
26
25
Casper
220
28
287
187
25
26
15
Ogden
80N
80
65
Salt Lake City
Rock Springs
80
Cheyenne
80

Figure 10
PROPOSED HISTORIC TRAIL ROUTE IN WYOMING AND UTAH

TRAIL ADMINISTRATION AND COSTS

TRAIL ADMINISTRATION

Administration of the trail will be the responsibility of the States. The Secretary of the Interior, under existing authorities, will encourage and assist interested Federal, State, local, and private organizations in the future planning and development of the Mormon Trail. The Mormon Pioneer Trail Foundation should coordinate the efforts of voluntary organizations and individuals concerned with trail preservation and development. In Nebraska and Wyoming where the Mormon and Oregon Trails coincide, close coordination will be necessary to obtain maximum efficiencies.

Detailed surveys of historical, archeological, and cultural resources along the proposed trail should be undertaken following national designation. Properties listed or eligible for listing in the National Register of Historic Places that would be affected by the proposal would be protected according to procedures established by the Advisory Council on Historic Preservation, as required by Section 106 of the National Historic Preservation Act (80 Stat. 915) and Executive Order 11593 (May 13, 1975).

However, Section 4(f) of the Department of Transportation Act, as amended, would not apply to highway agency activities such as modification, changes, or repairs of a routine nature within the rights-of-way of the roads and highways identified as the Mormon Pioneer National Historic Trail.

Planning and development of the trail should include appropriate measures to ensure the protection and maintenance of the historic integrity of the route, safeguards against vandalism of trail remnants and sites, and inappropriate commercial exploitation.

TRAIL COSTS

The Secretary of the Interior will encourage Federal, State, local, and private interests to develop the high-potential trail segments using existing Federal and State programs. Federal costs for the Mormon Pioneer National Historic Trail will be limited to provision of the initial set of directional and interpretive signs, estimated to be approximately $300,000. The Secretary of the Interior will be authorized to make these funds available to States upon application by the Governors. Erection, maintenance, and replacement of signs will be the responsibility of the States.

Although the placement and maintenance of signs and route markers will not involve direct Federal assistance, compliance with all Federal Highway Administration rules, regulations, and procedures which govern such activities will be necessary.

RELATIONSHIP TO PEOPLE

Since ancient times, trails have been of great importance to man's way of life. As traffic corridors, they have provided mobility for many purposes. Trails enabled trade, communication, and movement to improve social and economic conditions.

POPULATION

There are over 5.6 million residents in the 4 States the trail crosses. Table 7 shows the number of residents in each State in 1970 and the projections to the year 2000.

TABLE 7

POPULATION OF THE MORMON TRAIL REGION[1]

State	1970[2] Population	Population Projections[3]	
		1980	2000
Iowa	2,800,000	3,000,000	3,700,000
Nebraska	1,500,000	1,600,000	1,900,000
Wyoming	330,000	360,000	430,000
Utah	1,060,000	1,390,000	2,225,000
TOTALS	5,690,000	6,350,000	8,255,000

[1] Includes only those States which the trail actually crosses.

[2] U. S. Bureau of the Census data, 1970.

[3] Based on 1972 OBERS Projections, Series E, Vol. 4 – The States, U. S. Water Resources Council.

Residing within 100 miles (161 km.) of the trail are over 6 million people as shown in table 8. The majority of these people live in 12 Standard Metropolitan Statistical Areas as depicted in figure 11. By the year 2000 the population within this 100-mile (161-km.) corridor is expected to increase about 24 percent to approximately 8 million.

TABLE 8

POPULATION OF THE MORMON TRAIL CORRIDOR[1]

State	1970 Population
Illinois	1,100,000
Iowa	2,000,000
Nebraska	1,500,000
Wyoming	270,000
Utah	1,100,000
Other[2]	500,000
TOTAL	6,470,000

[1] Population within 100 miles (161 km.) of the trail.

[2] States other than those through which the trail actually passes but having residents within 100 miles (161 km.) of the corridor.

VISITATION

In 1975 total visitation at historic sites and recreation areas along the route was estimated at 8,900,000.[1] Most of this visitation occurred at historic sites that have received major interpretive development such as Nauvoo, Illinois; Florence, Nebraska; Fort Laramie and Fort Bridger, Wyoming; and Pioneer Trail Historic Park and Temple Square in Salt Lake City, Utah.

Much of the existing use involves multi-purpose sites such as highway rest areas and State parks. There is no information available which would permit an accurate determination of the percentage of total use directly attributable to the Mormon Trail or its interpretation. The trail proposal, if adopted, will combine many

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[1] Based on data supplied by State park, forest, recreation, and historical agencies; the Army Corps of Engineers; U. S. Fish and Wildlife Service; U. S. Forest Service; National Park Service; Bureau of Reclamation; and the Church of Jesus Christ of Latter-day Saints.

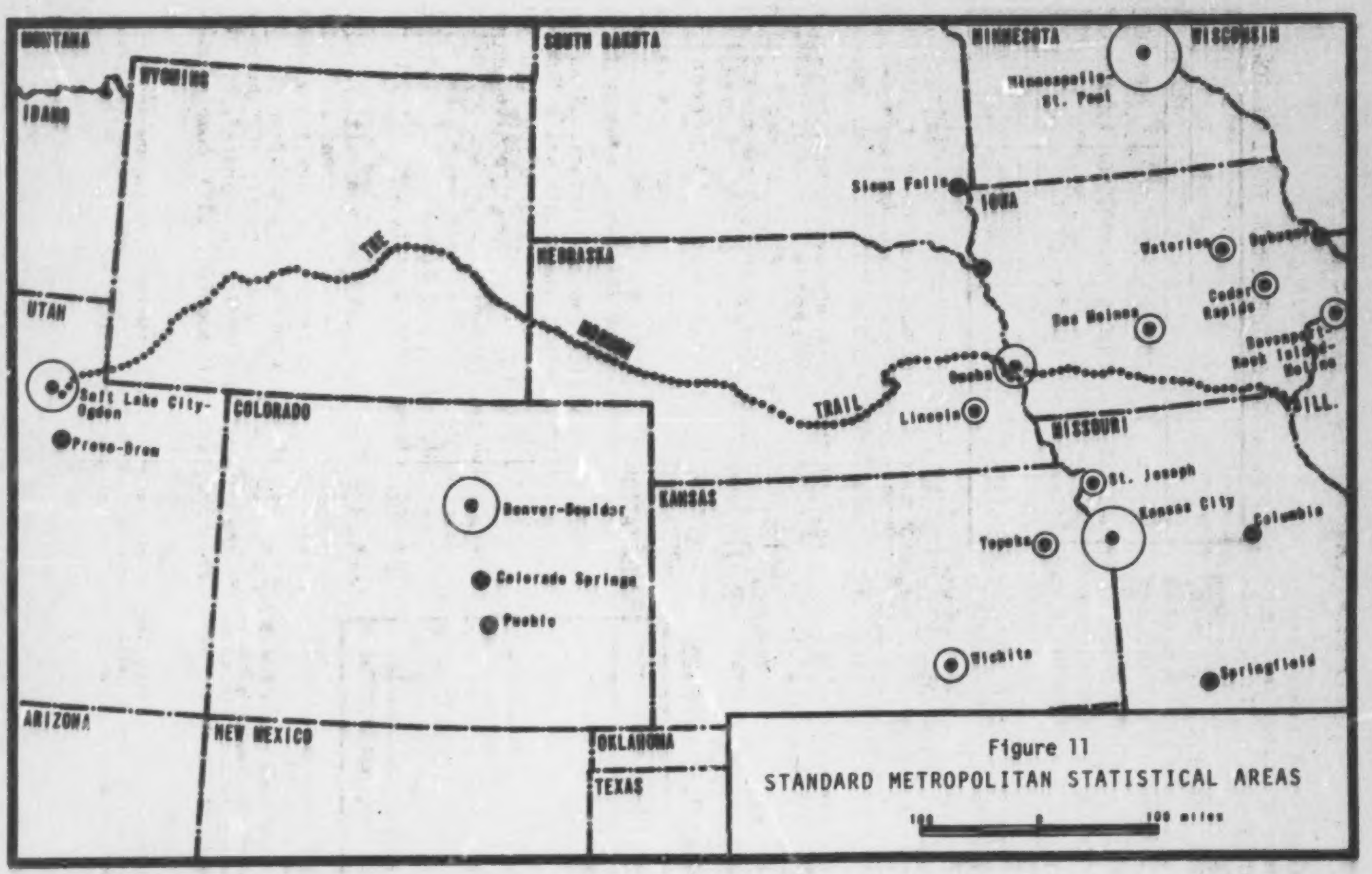
MONTANA
IDAHO
WYOMING
UTAH
SOUTH DAKOTA
NEBRASKA
MINNESOTA
WISCONSIN
IOWA
ILL.
MISSOURI
KANSAS
COLORADO
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
THE
MORMON
TRAIL
Minneapolis-St. Paul
Sioux Falls
Waterloo
Dubuque
Cedar Rapids
Des Moines
Davenport-Rock Island-Moline
Omaha
Lincoln
St. Joseph
Kansas City
Topeka
Columbia
Wichita
Springfield
Denver-Boulder
Colorado Springs
Pueblo
Salt Lake City-Ogden
Provo-Orem
100
0
100 miles

Figure 11
STANDARD METROPOLITAN STATISTICAL AREAS

roads and highways that intersect or parallel the trail into a uniformly marked route. Consultation with the affected State highway departments during the course of this study indicates that formal designation and marking of the routes with directional and interpretive signs is not expected to generate a significant amount of additional traffic. However, some travelers may be drawn to the marked trail from other nearby routes. Any future increase in use will take place largely during the summer season which is approximately 20 weeks long. Little or no increase is expected in winter use.

On the other hand, every State along the route has identified a growing need for additional hiking trails. Consequently, existing and any new cross-country trails that might be developed by State or local interests on or near the route are expected to receive considerable use by hikers, backpackers, horseback riders, and bicyclists.

SOCIOECONOMIC EFFECTS

The proposed Mormon Pioneer National Historic Trail will enhance the recreation and historical experience of travelers and further contribute to the economy of the area. Expenditures for outdoor recreation and associated services already contribute significantly to that economy, for recreation has been and still remains one of the main industries of the region. Development of the trail will create a small increase in the tourism base of affected States, and the expansion of commercial and recreation services will proportionately increase local tax revenues and employment levels.

The use of established private recreation and historical facilities along the trail is compatible with the proposal and should be encouraged. The private sector will be favorably impacted by increases in expenditures for transportation, food, gifts, souvenirs, lodging, and related services.

It should be emphasized that the intent of the historic trail proposal is not to promote additional tourism and increase the sum total of use by motorized vehicles, but rather to simply enhance the experience of those already traveling on or near the route.

The Mormon Trail route traverses approximately 400 miles (644 km.) of land containing potential energy resources, including oil shale and coal deposits in southwest Wyoming. The route does not cross any sites of active mineral extraction. It does, however, pass through areas containing deposits of economic importance - phosphate ores in Sublette and Lincoln Counties, Wyoming, limestone between Sidney and Scottsbluff, Nebraska, trona and uranium near Rock Springs, Wyoming. The designation and marking of the Mormon Pioneer National Historic Trail will in no way preclude the development of known mineral deposits or any other short- or long-term uses of the land.

ALTERNATIVES FOR ESTABLISHMENT OF THE TRAIL

The following alternatives were considered during the study of the Mormon Trail:

ALTERNATIVE NO. 1 - NO FEDERAL ACTION

The effect of a no-action alternative would be basically a maintenance of the status quo. Concerned public and private organizations could interpret "no designation" as a lack of interest at the national level and much of the momentum for planning, preservation, and interpretive development along the historic route would be lost. However, some additional development and interpretation by individuals, local agencies, and private organizations would take place.

ALTERNATIVE NO. 2 - DESIGNATION ONLY

This alternative is limited to designation by Congress of the entire route as the Mormon Pioneer National Historic Trail. Neither directional marking and interpretive signs along the highways to enhance the experience of those traveling the route nor any other developments are included in this alternative.

Designation would recognize the original trail's significance as a national historic route, but would provide limited incentive for preservation and development of historic sites.

ALTERNATIVE NO. 3 - DESIGNATE AND MARK A NATIONAL HISTORIC TRAIL ALONG THE MORMON TRAIL

This alternative is the proposed action as stated in the report. The historic importance of the Mormon Trail would be recognized through designation as the Mormon Pioneer National Historic Trail. The Secretary of the Interior would utilize this expression of national interest to stimulate and assist public and private entities in further coordinated planning and development using existing programs and funds. To facilitate retracement of the route and connect the numerous historic and recreation sites, the route would be marked with a standard symbol.

Among the several proposals considered by the Federal-State study team, this alternative received the strongest support at the public meetings held in each of the States. Although the reasons given varied to some degree, there was a general consensus by study participants and other interest groups and individuals on the following points:

1. Although the Mormon Trail is but one of many which form a westward migration corridor, some type of national recognition and uniform marking would be appropriate.

2. Given the current economic situation and other national priorities, now is not the time for a massive Federal investment in the Mormon Trail.

Further, much can be done without substantial expenditure by the Federal Government.

3. No plan would be supported which created the possibility that any Federal or State agency might utilize the power of eminent domain to acquire a continuous strip of land for the entire Mormon Trail corridor.

4. Developmental activities along the trail should be primarily initiated by local agencies and/or citizen groups.

ALTERNATIVE NO. 4 - DESIGNATE THE TRAIL, ESTABLISH A NATIONAL HISTORIC TRAIL, INCLUDING SELECTED HIKING, BIKING, OR BRIDLE TRAILS

This alternative consists of the proposed action, plus the development of hiking, biking, or horseback riding trails along the route segment identified as having high potential for recreation and historical uses.

Scenic quality, recreation potential, and the presence of significant historic sites in the trail corridor were major criteria in determining high-potential route segments.

This alternative consists of three separate options:

A. *Develop Hiking and Biking Trails within the Rights-of-Way of Selected Highways.* Approximately 300 miles (483 km.) of high-potential segments could be utilized for hike-bike trails within the rights-of-way of existing primary and secondary highways.

B. *Develop Hiking, Biking, or Bridle Trails on or Adjacent to Selected Minor or Primitive Roads.* Approximately 300 miles (483 km.) of hiking, biking, or horseback riding trails, not including the 300 miles (483 km.) referred to in Alternative 4A, could be developed on high-potential route segments adjacent to minor or primitive roads.

In addition to recreation opportunities provided in Alternative 4A, this option would provide for continuous highway and back-road hiking, biking, and horseback riding trails along each of the high-potential segments.

C. *Develop Hiking or Bridle Trails on Cross-Country Portions of the Mormon Trail.* About 100 miles (161 km.) of hiking and horseback riding trails could be located on cross-country portions of high-potential segments adjacent to existing remnants of the Mormon route. This mileage is in addition to the 600 miles (966 km.) referred to in Alternatives 4A and 4B.

More recreation opportunities would be offered by this alternative than by the other alternatives. In certain high-potential segments, the use of existing canal and levee rights-of-way which closely follow the route could provide a quality trail experience.

Combined concepts in this alternative would establish a series of hiking trails along highways, roads, and cross-country segments possessing high potential for historical, recreational, and/or scenic interest along the Mormon Trail corridor.

As shown on table 9, Alternatives and Costs, Alternative No. 4 options, individually or in combinations, represent multi-million-dollar Federal investments. Although certain elements of this alternative did receive moderate support, a general resistance to major Federal investments in a segmented or highway-oriented hiking trail developed early in the study process. Further, study participants were concerned with possible adverse impacts on local economies and the loss of highly productive agricultural lands. Therefore, it was the consensus that implementation of the more desirable hiking trail features of Alternative No. 4 be dependent on non-Federal initiatives.

As evidence of its continuing interest in future trail possibilities, the Bureau of Outdoor Recreation will make available the field data and other related information collected during the study and provide technical assistance to those interested in carrying out the recommendations of this report and to State, local, and private entities concerned with the development of additional hiking, biking, and bridle trails.

BOR Photo

Ayers Natural Bridge in Wyoming was a favored emigrant camping place and is today a public recreation area.

TABLE 9 - MORMON TRAIL ALTERNATIVES AND COSTS

TABLE 9 - MORMON TRAIL ALTERNATIVES AND COSTS

No. 1	No. 2	No. 3	No. 4a	No. 4b	No. 4c	Summary of Alternative No. 4 Options
No action	Congressional designation of the route as the Mormon Pioneer National Historic Trail	Congressional designation of the route as the Mormon Pioneer National Historic Trail	Congressional designation of the route as the Mormon Pioneer National Historic Trail	Congressional designation of the route as the Mormon Pioneer National Historic Trail	Congressional designation of the route as the Mormon Pioneer National Historic Trail	Congressional designation of the route as the Mormon Pioneer National Historic Trail
		Marked trail (1300 miles - 2092.1 km.) $300,000 for signing $30,000 annual maintenance	Marked trail (1300 miles - 2092.1 km.) $300,000 for signing $30,000 annual maintenance	Marked trail (1300 miles - 2092.1 km.) $300,000 for signing $30,000 annual maintenance	Marked trail (1300 miles - 2092.1 km.) $300,000 for signing $30,000 annual maintenance	Marked trail (1300 miles - 2092.1 km.) $300,000 for signing $30,000 annual maintenance
			Hike/bike trails along highway rights-of-way (300 miles - 482.8 km.) $5,000,000 development $2,000,000 annual maintenance			a plus b $8,300,000 acquisition and development $4,030,000 annual maintenance -OR-
				Hike/horse trails along primitive roads (300 miles - 482.8 km.) $3,000,000 acquisition and development $2,000,000 annual maintenance		a plus c $6,800,000 acquisition and development $2,280,000 annual maintenance -OR-
					Cross-country trails (100 miles - 160.9 km.) $1,500,000 acquisition and development $250,000 annual maintenance	b plus c $4,800,000 acquisition and development $2,280,000 annual maintenance -OR-
						a plus b plus c $9,800,000 acquisition and development $4,280,000 annual maintenance
No cost	No cost	$300,000 development $30,000 annual maintenance	$5,300,000 development $2,030,000 annual maintenance	$3,300,000 acquisition and development $2,030,000 annual maintenance	$1,800,000 acquisition and development $280,000 annual maintenance	

APPENDIX A — CRITERIA FOR NATIONAL SCENIC TRAILS

NATIONAL SIGNIFICANCE

National scenic trails, for their length or the greater portion thereof, should incorporate a maximum of significant characteristics, tangible and intangible, so that those, when viewed collectively, will make the trail worthy of national scenic designation. National significance implies that these characteristics, i.e., the scenic, historical, natural, or cultural qualities of the areas through which the trail passes, are superior when compared to those of other trails - not including national scenic trails - situated throughout the country. National scenic trails should, with optimum development, be capable of promoting interest and drawing power that could extend to any section of the conterminous United States.

ROUTE SELECTION

1. The routes of national scenic trails should be so located as to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historical, natural, or cultural qualities of the areas through which such trails may pass. They should avoid, insofar as practicable, established highways, motor roads, mining areas, power transmission lines, existing commercial and industrial developments, range fences and improvements, private operations, and any other activities that would be incompatible with the protection of the trail in its natural condition and its use for outdoor recreation.

2. National scenic trails of major historic significance should adhere as accurately as possible to their main historic route or routes.

ACCESS

National scenic trails should be provided with adequate public access through establishment of connecting trails or by use of trail systems other than the National Trail System. Access should be provided at reasonable intervals and should take into consideration the allowance for trips of shorter duration.

PLACEMENT

National scenic trails shall be primarily land based.

LENGTH

National scenic trails shall be extended trails, usually several hundred miles or longer in length.

CONTINUITY

National scenic trails should be continuous for the duration of their length.

APPENDIX B
PROPOSED CRITERIA FOR NATIONAL HISTORIC TRAILS

DESIGNATION

National Historic Trails may be authorized and designated only by Act of Congress. Studies of routes for designation as National Historic Trails shall be made for those trail routes named in the National Trails System Act which are substantially of a historic nature and other similar study routes subsequently authorized by Congress.

Determination of the national significance of a proposed National Historic Trail shall be made in accord with the criteria of national significance developed under the Historic Sites Act of 1935. As is the case in the designation of National Historic Landmarks, the criteria which address the qualities of association and integrity will apply to the entire historic entity and to the segments recommended for specific use and identification.

National Historic Trails are segments of historic routes established as interpretive/recreation trails. Travel by foot, horseback, bicycle, or other non-motorized means would be permitted where appropriate along such trails. A historic trail may be on or follow a waterway. Segments chosen should represent the route or its general historic environment or contain historic structures and sites important to the trail. Selected, existing public highways and roads approximating the historic alignment of a historic route may be marked to facilitate retracement of the historic route by motorized vehicle or bicycle and tie together trail segments.

The Federal Government would be responsible for protecting and maintaining only those segments of the trail crossing Federal lands. Federal acquisition would be restricted to those lands needed for insuring historical integrity or for the interpretation and preservation of historic sites, structures, objects, and/or trail remnants having high potential for enhancing the public's identification of the Nation's historic heritage, or whose historic integrity could not be preserved under any other ownership. The balance would be protected and maintained by States and local governments and private interests. Recreational use of a National Historic Trail shall be directed toward or complement the appreciation of its history and its surviving historic remnants.

National Historic Trail studies shall be conducted by the Secretary of the Interior or by the Secretary of Agriculture where lands administered by him are involved. Such studies shall be conducted in consultation with the heads of other Federal agencies administering land through which the proposed historic trail would pass and in cooperation with interested interstate, State and local government agencies, public and private organizations, and landowners and land users concerned. An environmental assessment is required for each study.

ROUTE LOCATION

Routes, or segments thereof, containing man-made developments of a disruptive or distracting nature and lacking historical integrity generally will not be established as National Historic Trails.

To facilitate retracement of designated historic routes, existing public roads and highways nearest to the route's historic location may be marked. Guide maps may be made available and interpretive displays erected to indicate to the traveler where the actual historic route is being followed or crossed.

Development of National Historic Trails should be accomplished in a manner that will protect historic sites, remnants, and artifacts. Consideration should te given to protection of historic trails from incompatible land use.

APPENDIX C

SITES LISTED ON
THE NATIONAL REGISTER OF HISTORIC PLACES
AND
PUBLIC RECREATION AREAS

MORMON TRAIL CORRIDOR
(ILLINOIS, IOWA, NEBRASKA, WYOMING, AND UTAH)

TABLE 10 - RECREATION AREAS AND ACTIVITIES - ILLINOIS-IOWA

Map Key No.	Name of Area	Ownership[1]	Boat	Camp	Fish	Hike	Hunt	Picnic	Swim
1	Nauvoo State Park	S	X	X	X	X		X	
2	Chatfield Park	C		X			X	X	
3	Wilson Lake	C		X			X	X	
4	Shimek State Forest	S		X	X	X	X	X	
5	Bentonsport River Front Park	C			X				
6	Lacey-Keosauqua State Park	S	X	X	X	X	X	X	
7	Lake Fisher Park	C	X		X	X	X		X
8	Drakesville Park	C		X	X				
9	Lake Wapello State Park	S		X				X	
10	Sharon Bluffs State Park	S			X	X		X	
11	Lelah Bradley Park	C	X	X	X			X	
12	Mystic Reservoir	C	X	X				X	
13	Corydon Lake County Park	C						X	
14	Bob White State Recreation Area	S	X	X	X			X	
15	Nine Eagles Recreation Area	S	X	X	X			X	X
16	Slip Bluff Park	C		X	X			X	
17	Whitebreast Unit	S				X	X		
18	Thayer Pond	S	X		X		X		
19	Talmadge Hill Park	C						X	
20	Green Valley Recreation Area	S	X					X	X
21	Orient Gun Club	P							
22	Greenfield Reservoir Recreation Area	C				X		X	
23	Meadow Lake	S	X		X		X		
24	Adair Wildlife Area	S					X		
25	Mormon Trail Park	C	X	X				X	
26	Cold Springs State Park	S	X	X	X	X		X	X
27	Indian Creek Wildlife Area	C					X		
28	Iranistan Rock Quarry	P							
29	Willow Slough	S	X		X		X		
30	Lake Manawa State Recreation Area	S	X		X	X	X	X	
31	Missouri River Access	S	X	X	X			X	
32	Smith Area	S			X	X			
33	Gifford Sanctuary	S				X			

[1] Ownership Symbols: F-Federal; S-State; C-County; M-Municipal; P-Private; Q-Quasi-Public.

TABLE 11 - NATIONAL REGISTER SITES ALONG THE MORMON TRAIL CORRIDOR - ILLINOIS AND IOWA

Ref.	Name of Site	Location	County
A	Carthage Jail[1]	Carthage	Hancock
B	Nauvoo Historic District[1] (National Historic Landmark)	Nauvoo	Hancock
C	General William Worth Belknap House	Keokuk	Lee
D	Dr. Frank Brown House	Keokuk	Lee
E	U. S. Post Office and Courthouse	Keokuk	Lee
F	Justice Samuel Freeman Miller House	Keokuk	Lee
G	Old Fort Madison	On site in Fort Madison	Lee
H	Bentonsport	Keosauqua vicinity	Van Buren
J	Hotel Manning	Keosauqua	Van Buren
K	James B. Weaver House	Bloomfield	Davis
L	Davis County Courthouse	Bloomfield	Davis
M	Stringtown House	Centerville vicinity	Davis
N	Stratton House	Centerville	Appanoose
P	Pleasant Hill School	Lineville vicinity	Wayne
Q	Creston Railroad Depot	Creston	Union
R	Grenville M. Dodge House	Council Bluffs	Pottawattamie
S	Pottawattamie County Jail	Council Bluffs	Pottawattamie

[1] Related Directly to Mormon Trail.

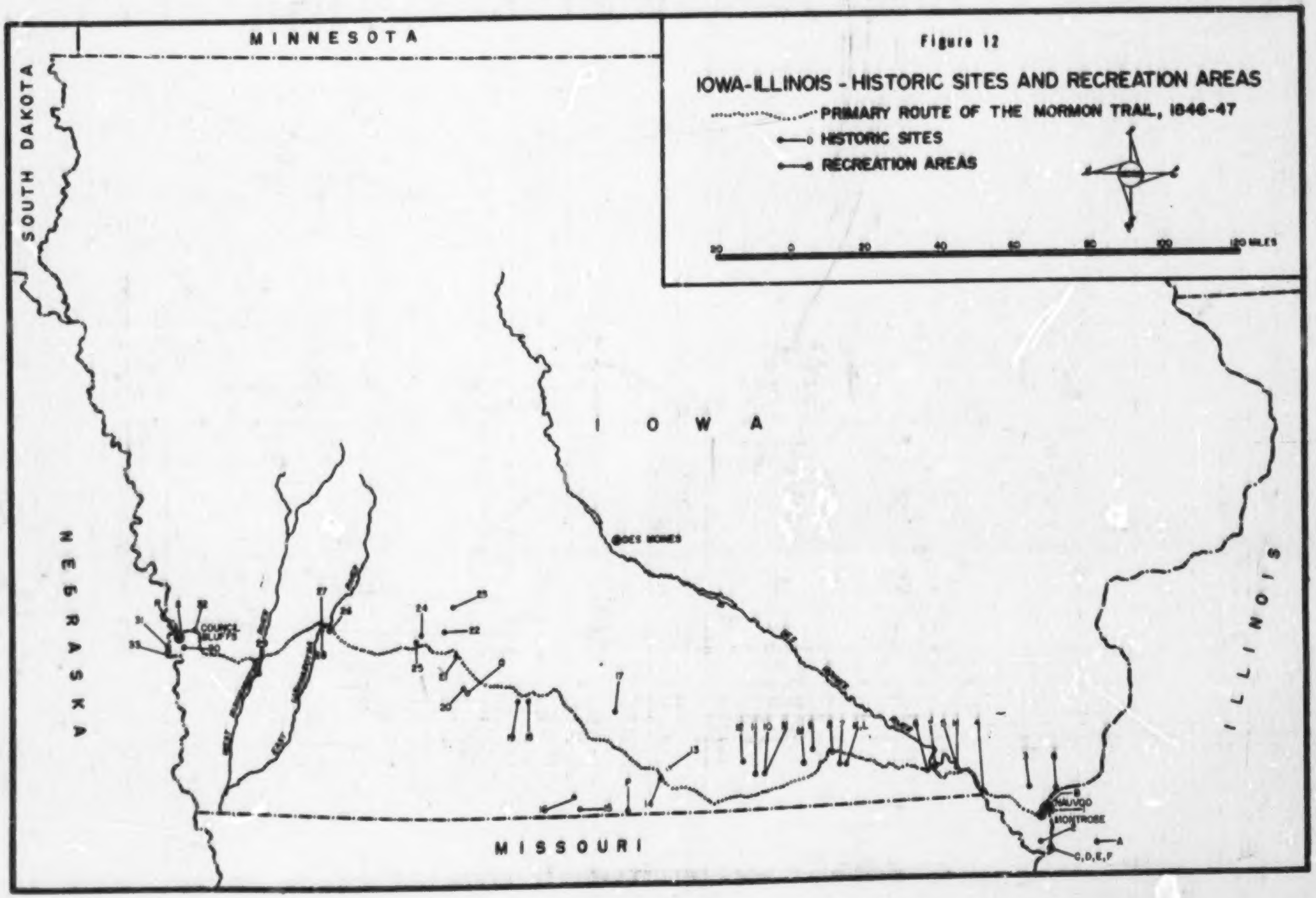

Figure 12

IOWA-ILLINOIS - HISTORIC SITES AND RECREATION AREAS

PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HISTORIC SITES
RECREATION AREAS
20
0
20
40
60
80
100
120 MILES
MINNESOTA
SOUTH DAKOTA
NEBRASKA
IOWA
MISSOURI
ILLINOIS
DES MOINES
COUNCIL BLUFFS
NAUVOO
MONTROSE
A
C,D,E,F
31
33
32
30
27
28
24
25
22
23
21
20
17
13
14
15
16
12
11
10
9
8
7

TABLE 12 - RECREATION AREAS AND ACTIVITIES - NEBRASKA

Map Key No.	Name of Area	Ownership[1]	Boat	Camp	Fish	Hike	Hunt	Picnic	Swim
1	Fontenelle Forest and National Recreation Trail	Q				X		X	
2	Two Rivers Recreation Area	S	X	X	X	X	X	X	
3	Louisville Recreation Area	S	X	X	X	X	X	X	
4	Memphis Recreation Area	S	X	X	X	X	X	X	
5	Pioneer Wayside Area	S		X		X		X	
6	Fremont Recreation Area	S	X	X	X	X		X	X
7	Whitetail Special Use Area	S				X	X		
8	Skull Creek Wildlife Area (Able)	S				X			
9	Skull Creek Wildlife Area (Brainard)	S				X			
10	Mormon Trail Wayside Area	S				X		X	
11	Hord Lake Recreation Area	S	X	X	X	X	X	X	X
12	Long Bridge	C	X	X	X	X			
13	Cornhusker Special Use Area	S				X	X	X	
14	Stolley	M				X		X	
15	Mormon Island Wayside Area	S	X	X	X	X		X	X
16	Ash Grove Use Area	S				X		X	
17	Loch Linda Special Use Area	S	X	X	X	X	X	X	X
18	Cheyenne Wayside Area	S	X	X	X	X		X	
19	Wood River West Special Use Area	S	X	X	X	X	X		X
20	War Axe Wayside Area	S	X	X	X	X		X	X
21	Denman Island Special Use Area	S	X		X	X	X	X	
22	Windmill Wayside Area	S		X	X	X		X	X
23	Bassway Strip Wildlife Area	S	X	X	X	X	X		X
24	Bufflehead Wildlife Area	S	X	X		X		X	
25	Fort Kearny Historical Park	S				X		X	
26	Kearney Recreation Area	S	X	X	X	X		X	X
27	Kea West Wildlife Area	S	X	X	X	X	X		X
28	Kea Lake Wildlife Area	S	X		X	X	X		X
29	Cottonmill Lake Recreation Area	M	X	X	X	X		X	X
30	East Odessa Wildlife Area	S	X	X	X	X	X	X	
31	Union Pacific Wayside Area	S	X	X	X	X		X	
32	Coot Shallows Wildlife Area	S	X	X	X	X	X	X	X
33	Blue Hole East Wildlife Area	S	X	X	X	X	X		X
34	Sandy Channel Wildlife Area	S	X		X	X	X		X
35	Blue Hole Wildlife Area	S	X	X	X	X	X	X	X
36	West Elm Creek Wildlife Area	S			X	X			
37	Dogwood Wildlife Area	S	X	X	X	X	X	X	X
38	Johnson Lake Recreation Area	S	X	X	X	X	X	X	X
39	Lexington (North)	S	X		X	X			X
40	Lexington (South)	S	X		X	X			X
41	Overton Use Area	S				X			
42	East Darr Use Area	S	X		X	X	X		X
43	Darr Use Area	S	X		X	X	X		X
44	Darr Strip Use Area	S	X		X	X	X		X
45	Plum Creek Special Use Area	S			X	X	X		
46	East Cozad Use Area	S				X		X	
47	Cozad Wildlife Area	S	X	X	X	X	X		X
48	Gallagher Canyon Recreation Area	S	X	X	X	X	X	X	X
49	West Cozad Wildife Area	S	X	X	X	X	X		X
50	Midway Special Use Area	S						X	
51	East Gothenburg Wildlife Area	S	X	X	X	X	X		X
52	West Gothenburg Wildlife Area	S	X	X	X	X	X		X
53	East Willow Island Wildlife Area	S	X	X	X	X	X		X
54	Jeffrey Lake Special Use Area	S		X	X	X	X	X	
55	Brady Wildlife Area	S	X	X	X	X	X	X	X
56	Willow Island Wildlife Area	S	X	X	X	X	X	X	X
57	West Brady Wildlife Area	S	X		X	X			X
58	Fort McPherson Wayside Area	S	X	X	X	X		X	
59	Cottonwood Canyon Special Use Area	S			X	X	X		
60	Box Elder Canyon Special Use Area	S			X	X			
61	West Maxwell Wildlife Area	S	X	X	X	X	X		X
62	Fremont Slough Wildlife Area	S	X	X	X	X	X		X
63	Lake Maloney Recreation Area	S	X	X	X	X	X	X	X
64	Buffalo Bill Ranch Historical Park	S				X			
65	Birdwood Lake Wildlife Area	S		X	X			X	
66	East Hershey Wildlife Area	S	X	X	X	X	X		X
67	Hershey Wildlife Area	S	X	X	X	X	X		X
68	West Hershey Wildlife Area	S	X		X	X	X		X
69	East Sutherland Wildlife Area	S	X	X	X	X	X	X	X
70	Sutherland Reservoir Special Use Area	S	X	X	X	X	X	X	X
71	Ogallala Strip Wildlife Area	S	X			X	X		
72	Big Springs Wildlife Area	S				X	X		
73	Lake Ogallala Recreation Area	S	X	X	X	X	X	X	X
74	Lake McConaughy Recreation Area	S			X	X		X	X
75	Clear Creek (Lake McConaughy) Special Use Area	S			X	X	X		
76	Ash Hollow Historic Park	S				X		X	
77	Blue Water Battlefield Overlook Historical Park	S				X			
78	Bridgeport Recreation Area	S	X	X	X	X	X	X	X
79	Wildcat Hills Recreation Area	S		X		X	X	X	
80	Nine Mile Creek Special Use Area	S			X	X	X	X	
81	Minatare Lake Recreation Area	S	X	X	X	X	X	X	X

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[1] Ownership Symbols: F-Federal; S-State; C-County; M-Municipal; P-Private; Q-Quasi-Public.

TABLE 13 - NATIONAL REGISTER SITES ALONG THE MORMON TRAIL CORRIDOR - NEBRASKA

[illegible]	Name of Site	Location	County
A	Various sites in the Omaha Area	Omaha	Douglas
	Aquille Court Building		
	Bank of Florence[1]		
	Guy C. Barton House		
	General George Crook House		
	George A. Joslyn Mansion		
	Omaha National Bank Building		
	Union Passenger Terminal		
	Astro Theater		
	Burlington Headquarters Building		
	Burlington Station		
	City National Bank Building and Creighton Orpheum Theater		
	Joel N. Cornish House		
	Fort Omaha Historic District		
	Gottlieb Storz House		
	Trinity Cathedral		
B	Cabanne Archeological Site	About 2 miles north of Omaha	Douglas
C	Campe-Fremont I Archeological Site	Omaha vicinity	Douglas and Sarpy
D	Moses Merrill Mission and Oto Indian Village	LaPlatte	Sarpy
E	Various Sites in Belleview Area	Belleview	Sarpy
	Fontenelle Forest Historic District[1]		
	Fontenelle Bank		
	Burlington Depot		
	William Hamilton House		
	Old Log Cabin		
	Presbyterian Church		
F	Kurz Omaha Village	Papillion vicinity	Sarpy
G	Pahuk	Cedar Bluffs vicinity	Saunders
H	McClean (McClaine) Site	2 miles south of Inglewood	Saunders
J	Woodcliff Burials	Inglewood vicinity	Saunders
K	Yutan Site	Yutan vicinity	Saunders
L	Leshara Site	Leshara vicinity	Saunders
M	Love-Larson Opera House	Fremont	Dodge
N	Bellwood Archeological Site	Bellwood	Butler
P	Various Sites in Schuyler Area	Schuyler vicinity	Colfax
	Schuyler Site		
	Wolfe Archological Site		
R	Fey Archeological Site	Creston vicinity	Platte
S	Wurdeman-Lawson Archological Site	SE of Creston	Platte
T	Glur's Tavern	Columbus	Platte
U	Larson, Hanna Archeological Site (Looking Glass Site)	Monroe vicinity	Platte
V	Genoa Site[1]	1 mile south of Genoa	Nance
W	Burkett Archeological Site	SW of Genoa	Nance
X	Pawnee Mission and Burnt Village Archeological Site[1]	Genoa vicinity	Nance
Y	Wright Site	Genoa vicinity	Nance
Z	Fullerton Archeological Site	NE of Fullerton	Nance
AA	Horse Creek Pawnee Village	SW of Fullerton	Nance
BB	Cunningham Archeological Site	3 miles SE of Fullerton	Nance
CC	Cottonwood Creek Archeological Site	Belgrade vicinity	Nance
DD	Various Sites in Grand Island Area	Grand Island	Hall
	Stolley State Park Historic District[1]		
	Grand Island Carnegie Library		
	Grand Island FCC Monitoring Facility		
EE	George W. Frank House	Kearney	Buffalo
FF	Dobytown	SE of Kearney	Kearney
GG	Fort Kearny	2 miles west of Newark	Kearney
HH	Midway Stage Station	Gothenburg vicinity	Dawson
JJ	O'Fallon's Bluff	Sutherland vicinity	Lincoln
KK	California Hill (Oregon Trail Remains)	Brule vicinity	Keith
LL	Diamond Springs Stage Station Site	Brule vicinity	Keith
MM	Beauvais Ranch Site	Brule vicinity	Keith
NN	Leonidas A. Brandhoefer Mansion	Ogallala	Keith
PP	Ash Hollow Historic District	Lewellen vicinity	Garden
QQ	Ash Hollow Cave	Lewellen vicinity	Garden
RR	Oshkosh Opera House	Oshkosh	Garden
SS	Camp Clark Bridge[1]	Bridgeport	Morrill
TT	Courthouse and Jail Rocks[1]	Bridgeport vicinity	Morrill
UU	Chimney Rock[1] (National Historic Site)	Bayard vicinity	Morrill
VV	Mud Springs Pony Express Station	Dalton vicinity	Morrill
WW	Robidoux Pass (National Historic Landmark)	Gering vicinity	Scottsbluff
XX	Scotts Bluff National Monument	Gering vicinity	Scottsbluff
YY	Signal Butte	Gering vicinity	Scottsbluff

[1] Related Directly to Mormon Trail.

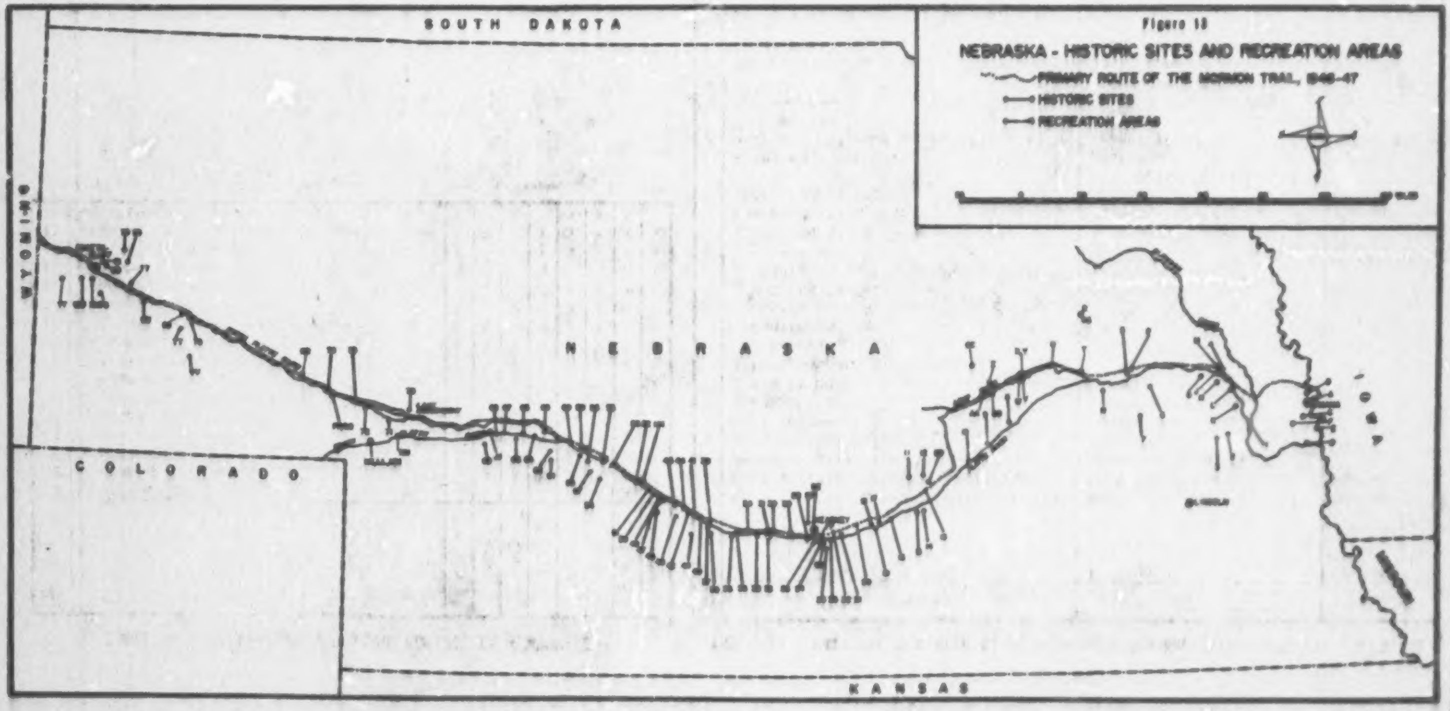

Figure 13

NEBRASKA - HISTORIC SITES AND RECREATION AREAS

PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HISTORIC SITES
RECREATION AREAS
SOUTH DAKOTA
WYOMING
COLORADO
NEBRASKA
IOWA
KANSAS

TABLE 14 - RECREATION AREAS AND ACTIVITIES - WYOMING

Map Key No.	Name of Area	Ownership[1]	Boat	Camp	Fish	Hike	Hunt	Picnic	Swim
1	Guernsey State Park	S	X	X	X	X	X	X	X
2	Glendo State Park	S	X	X	X	X	X	X	X
3	Medicine Bow National Forest	F	X	X	X	X	X		
4	LaPrele Reservoir	P			X				X
5	Converse County Park	C				X		X	
6	Casper Mountain County Park	C				X		X	
7	Alcova State Park	S	X	X	X	X		X	X
8	Pathfinder Reservoir	C	X	X	X		X	X	
9	Shoshone National Forest	F	X	X	X	X	X	X	X
10	Bridger-Teton National Forest	F	X	X	X	X	X	X	X
11	Sinks Canyon State Park	S		X	X	X	X	X	
12	Eden Valley Reservoir	F			X	X	X	X	X
13	Big Sandy State Park	S	X	X	X			X	X
14	Fontenelle Reservoir	F			X	X	X	X	X
15	Flaming Gorge National Recreation Area	F	X	X	X	X	X	X	X
16	Wasatch National Forest	F		X		X	X	X	

[1] Ownership Symbols: F-Federal; S-State; C-County; M- Municipal; P-Private; Q-Quasi-Public.

TABLE 15 - NATIONAL REGISTER SITES ALONG THE MORMON TRAIL CORRIDOR - WYOMING

Ref	Name of Site	Location	County
A	Sites in Torrington Area South Torrington Union Pacific Depot Union Pacific Depot	Torrington	Goshen
B	Fort Laramie National Historic Site[1]	Fort Laramie vicinity	Goshen
C	Fort Laramie Three-Mile Hog Ranch	Fort Laramie vicinity	Goshen
D	Register Cliff and Marker[1]	Guernsey vicinity	Platte
E	Oregon Trail Ruts[1]	Guernsey vicinity	Platte
F	Fort Fetterman	Douglas vicinity	Converse
G	Glenrock Buffalo Jump	Glenrock vicinity	Converse
H	Sites in Casper Area Fort Casper (site of Mormon Ferry)[1] Cantonment Reno Castle Rock Archeological Site Dull Knife Battlefield Middle Fork Pictograph-Petroglyph Panels Portuguese Houses	Casper	Natrona
J	Casper Buffalo Trap	Casper vicinity	Natrona
K	Independence Rock[1]	About 25 miles southwest of Casper on Route 220	Natrona
L	Pathfinder Dam	Southwest of Casper	Natrona
M	Bridger Immigrant Road-Waltman Crossing	Casper vicinity	Natrona
N	Tom Sun Ranch	About 6 miles west of Independence Rock	Carbon
P	South Pass City	South Pass City	Fremont
Q	South Pass[1]	About 10 miles southwest of South Pass City	Fremont
R	Parting-of-the-Ways Oregon Trail Historic Site	Farson vicinity	Sweetwater
S	Granger Stage Station	Granger	Sweetwater
T	Expedition Island	Green River	Sweetwater
U	Point of Rocks Stage Station	Rock Springs vicinity	Sweetwater
V	Fort Bridger[1]	Fort Bridger on Blacks Fork of the Green River	Uinta
W	Piedmont Charcoal Kilns[1]	14 miles northeast of Hillard	Uinta
X	Bridger Antelope Trap	Evanston vicinity	Uinta

[1] Directly Related to Mormon Trail.

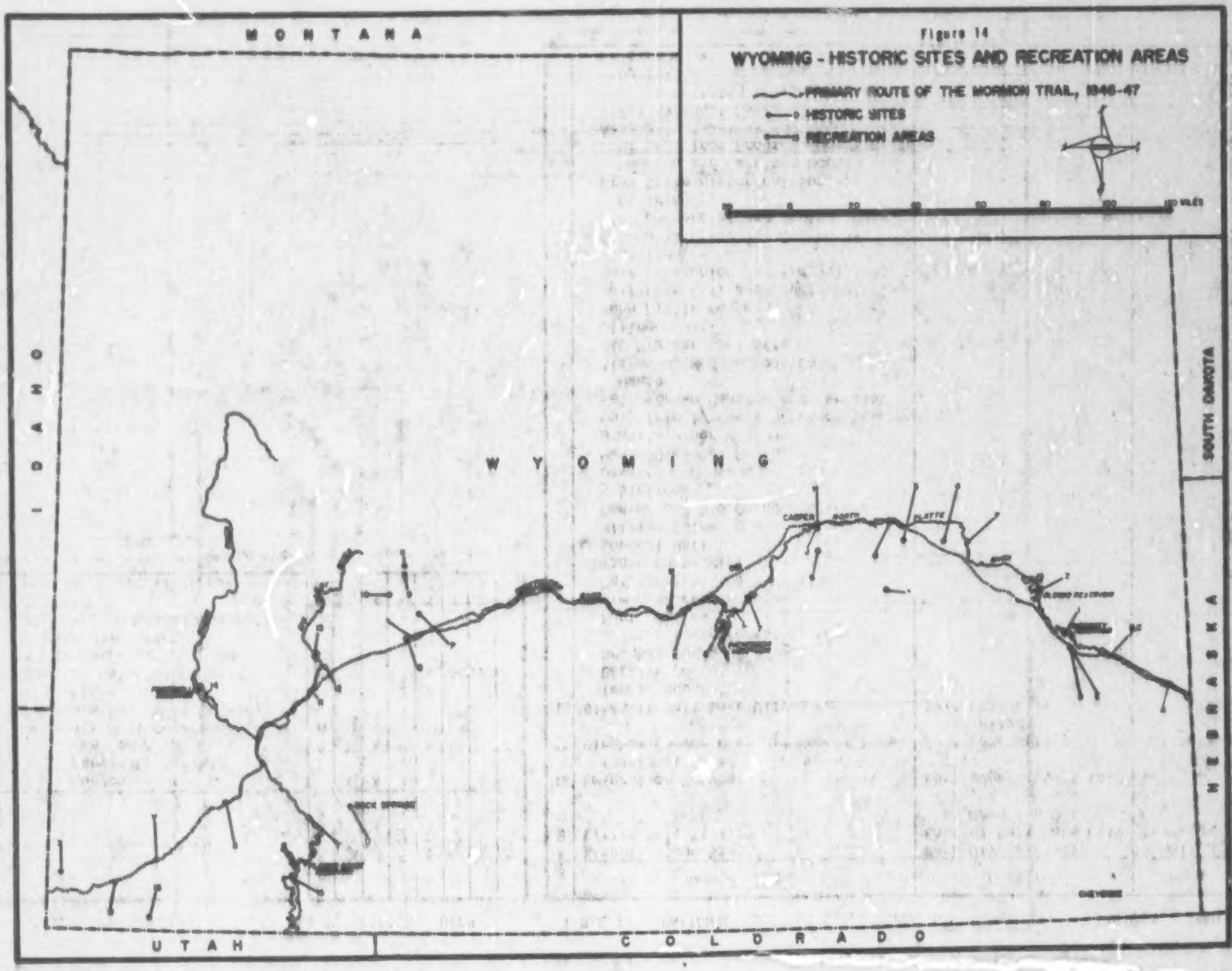

Figure 14

WYOMING - HISTORIC SITES AND RECREATION AREAS

PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HISTORIC SITES
RECREATION AREAS
20
0
20
40
60
80
100
120 MILES
MONTANA
SOUTH DAKOTA
NEBRASKA
IDAHO
WYOMING
UTAH
COLORADO
CASPER
NORTH
PLATTE
GLENDO RESERVOIR
ROCK SPRINGS
CHEYENNE

TABLE 16 - RECREATION AREAS AND ACTIVITIES - UTAH

Map Key No.	Name of Area	Ownership[1]	Boat	Camp	Fish	Hike	Hunt	Picnic	Swim
1	Echo Canyon Reservoir	F	X	X	X			X	
2	East Canyon Lake State Recreation Area	S	X	X	X	X	X	X	X
3	Mountain Dell Reservoir	M							
	Mountain Dell Golf Course, Washington Park	M		X	X	X		X	
4	Wasatch National Forest	F		X		X	X	X	
	Little Mountain Ski and Recreation Park					X		X	
5	Rockport Lake State Recreation Area	S	X	X	X	X	X	X	X
6	Pioneer Trail State Park	S				X		X	

[1] Ownership Symbols: F-Federal; S-State; C-County; M-Municipal; P-Private; Q-Quasi-Public.

TABLE 17 - NATIONAL REGISTER SITES ALONG THE MORMON TRAIL CORRIDOR - UTAH

Ref.	Name of Site	Location	County
A	Kimball Stage Stop	Park City vicinity	Summit
B	Little Dell Station[1]	East of Salt Lake City in Mountain Dell Canyon	Salt Lake
C	Emigration Canyon[1] (National Historic Landmark)	East edge of Salt Lake City	Salt Lake
D	Bingham Canyon Open Pit Copper Mine	Salt Lake City vicinity	Salt Lake
E	Sites in Salt Lake City Area	Salt Lake City	Salt Lake
	Temple Square[1]		
	Beehive House[1]		
	Brigham Young Lion House[1]		
	Brigham Young Forest Farmhouse[1]		
	Fort Douglas		
	Simon Bamberger House		
	Cathedral of the Madeleine		
	Isaac Chase Mill		
	Council Hall		
	William Culmer House		
	Denver and Rio Grande Railroad Station		
	Devereaux House		
	Henry Dinwoody House		
	Granite Paper Mill		
	Holy Trinity Greek Orthodox Church		
	Keith-Brown Mansion and Carriage House		
	Alfred W. McCune Mansion		
	Old Pioneer Fort Site		
	Ottinger Hall		
	John Platts House		
	Salt Lake City and County Building		
	Salt Lake Union Pacific Railroad Station		
	St. Marks Episcopal Cathedral		
	Utah Commercial and Savings Bank Building		
	Utah State Historical Society Mansion and Carriage House		
	ZCMI Cast Iron Front		
	Amussen's Jewelry		
	First National Bank		
	Karrick Building (Leyson-Pearsall Building)		
	Lollin Block		

[1] Related Directly to Mormon Trail.

NEVADA

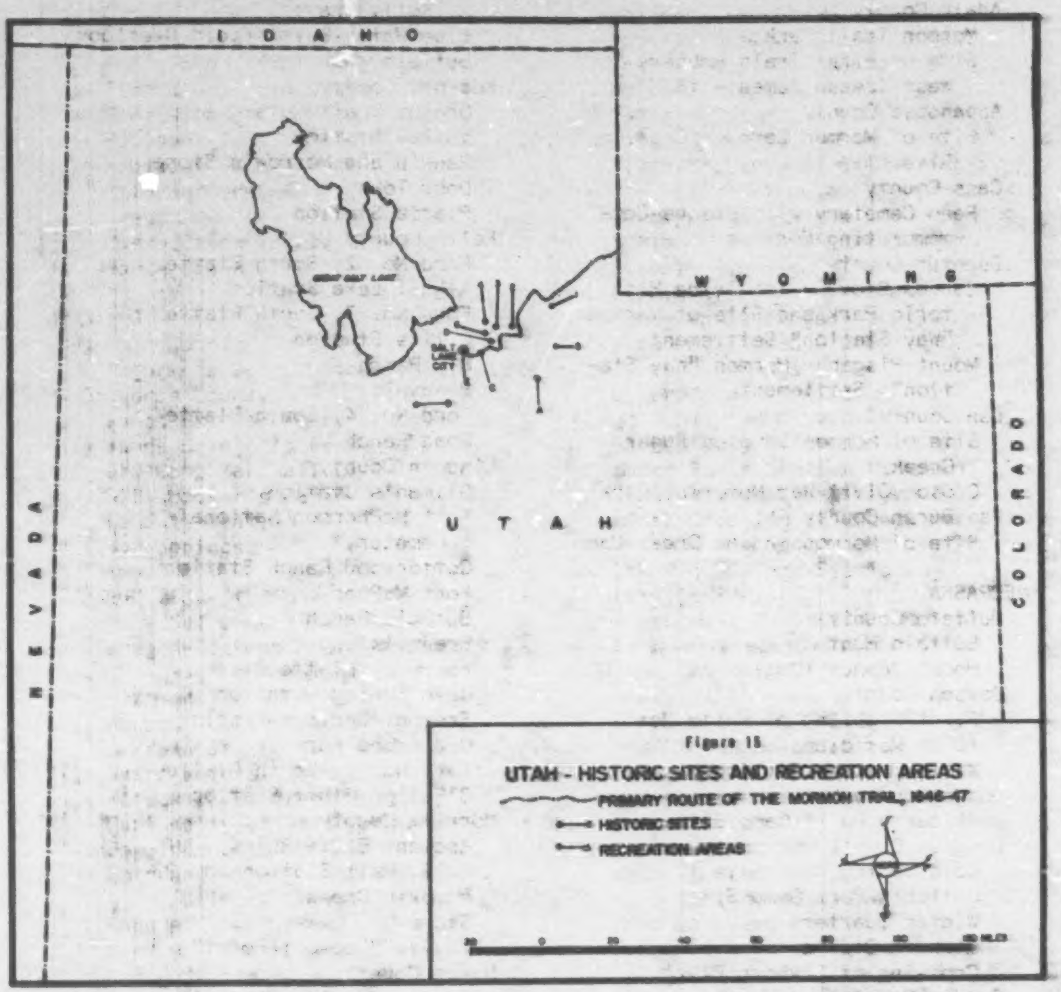
IDAHO
WYOMING
COLORADO
NEVADA
UTAH
GREAT SALT LAKE
SALT LAKE CITY
PRIMARY ROUTE OF THE MORMON TRAIL, 1846-47
HISTORIC SITES
RECREATION AREAS
20 0 20 40 60 80 100 120 MILES

Figure 15

UTAH - HISTORIC SITES AND RECREATION AREAS

APPENDIX D – HISTORIC SITES ALONG THE MORMON ROUTE NOT LISTED ON THE NATIONAL REGISTER OF HISTORIC PLACES

ILLINOIS
- None

IOWA
- Adair County
  - Mormon Trail Park
  - Site of First Train Robbery in West (Jesse James - 1873)
- Appanoose County
  - Site of Mormon Camp on Chariton River
- Cass County
  - Reno Cemetery with Plaque Commemorating Mormons
- Decatur County
  - Garden Grove - Trailside Historic Park and Site of Mormon "Way Station" Settlement
  - Mount Pisgah - Mormon "Way Station" Settlement
- Lee County
  - Site of Mormon Camp on Sugar Creek
  - Croton Civil War Memorial Park
- Van Buren County
  - Site of Mormon Indian Creek Camp

NEBRASKA
- Buffalo County
  - Buffalo Hunt
  - Hook's Ranch (Dogtown)
- Dawson County
  - First Sighting of White Men
  - 100th Meridian
  - Willow Island Station
- Dodge County
  - "Liberty Pole" Camp Site
- Douglas County
  - Cold Spring Camp Site
  - Cutler's Park Camp Site
  - Winter Quarters
  - Elkhorn Bluffs
  - Crossing of Elkhorn River
- Garden County
  - Windlass Hill
  - Rachel Pattison Grave
  - Fort Grattan

NEBRASKA, Continued
- Garden County, Continued
  - Ash Hollow Spring (lower)
  - Ash Hollow Trading Post
  - A. Kelly Grave
  - Blue Water Battlefield Overlook
  - Buffalo Jump
- Kearney County
  - Oregon Trail Ruts
  - Valley Station
  - Rankin and Morrow's Store
  - Doby Town
  - Platte Station
- Keith County
  - Ford No. 2, South Platte
  - Alkali Lake Station
  - Ford No. 3, South Platte
  - Gill's Station
  - Old Ranch
  - Beauvais
  - Ford No. 4, South Platte
  - Road Ranch
- Lincoln County
  - Gilman's Station
  - Fort McPherson National Cemetery
  - Cottonwood Ranch Station
  - Fort McPherson
  - Burke's Ranch
  - Brady Island
  - Forks of Platte River
  - Cold Springs Station
  - Fremont Springs Station
  - Old Adobe Fort
  - Ford No. 1, South Platte
  - O'Fallon Bluff Station
- Morrill County
  - Ancient Bluff Ruins
  - U. S. Mail Station No. 22
  - Pumpkin Creek
  - Store
  - Indian "Lookout Point"
- Nance County
  - Pawnee Mission Camp Site
  - Government Indian Station Site
  - Fording of the Loup
  - River Site

- NEBRASKA, Continued
  - Phelps County
    - 17-mile Station
    - Garden Station
    - Plum Creek Cemetery
    - Plum Creek Station
  - Scottsbluff County
    - Ficklin's Pony Express Station
    - Castle Rock
    - Rebecca Winters Grave
    - Fort John (1850-56)
    - Pierre D. Papin Grave
    - Fort Mitchell
    - Robidoux Trading Post
    - Robidoux Second Post
    - Emigrant Graves
    - Grave
    - Horse Creek Treaty Grounds
    - Horse Creek Station

- WYOMING
  - Carbon County
    - Astorians Camp, October 28, 1812
  - Converse County
    - James Bridger Ferry Monument
    - James Bridger's Ferry
    - Old Camp Marshall
    - Bill Hooker's Cabin
    - LaBonte Station
    - Hot Springs
    - Knob Hill
    - Bed Tick Station
    - Fort Fetterman
    - Oregon-Bozeman Trail Monument
    - Bill Hooker Monument
    - Bozeman Trail Monument
    - Hembree-Baker Graves
    - LaPrele Station
    - Ayers Natural Bridge
    - Attack on Emigrant Party
    - Mary Kelly et. al. Graves
    - Boxelder Station
    - Emigrant Names
    - A. H. Unthank Grave
    - Ford A - Deer Creek
    - Ford B - Deer Creek
    - North Platte Ferry Creek
    - Richards Bridge
    - Indian Ford - Deer Creek
    - Deer Creek Station
    - Ferdinand V. Hayden

- WYOMING, Continued
  - Converse County, Continued
    - Parker and Ringo Graves
    - Ada Magill Grave
  - Fremont County
    - Willie's Company Cemetery and Marker
    - The Old Castle (Castle Rock)
    - Unidentified Grave
    - Three Crossings Station (East)
    - Three Crossings Station
    - Names Cliff
    - Jeffrey City
    - Names Rock
    - Fifth Crossing of Sweetwater
    - Ice Spring (Slough)
    - Warm Spring Station
    - Sixth Crossing of Sweetwater
    - Seventh Crossing of Sweetwater
    - Eighth Crossing of Sweetwater
    - Immigrant Springs
    - Sarah A. Thomas Grave
    - Diamond Springs
    - Upper Mormon Spring
    - Unidentified Graves
    - Mormon Mail Station
    - Burnt Ranch Station Monument
    - Chas. Miller et. al. Grave
    - Ninth Crossing of Sweetwater
    - Whitman Monument
    - Pacific Springs Station
    - Pacific Springs
    - South Pass Exhibit
    - Pioneer Grave
  - Goshen County
    - Henry Hill Grave
    - Charles Bishop Grave
    - Red Cloud Indian Agency
    - Unidentified Grave
    - Wm. Clary Grave
    - Unidentified Grave
    - Cold Springs Station
    - Cold Springs
    - Cold Springs Monument
    - Old Rock Ranch
    - Oregon Trail Monument
    - Texas Cattle Trail Monument
    - Grattan Massacre Monument
    - Grattan Massacre Site
    - Bedeau's Ranch
    - Oregon Trail Monument

WYOMING, Continued
- Goshen County, Continued
  - Fort Bernard - 1845-47
  - Getiot Houses
  - Second Crossing, North Platte
  - Third Crossing, North Platte
  - Fourth Crossing, North Platte
  - Fort Platte Monument
  - Fort William
  - First Crossing, Laramie River
  - Second Crossing, Laramie River
  - Third Crossing, Laramie River
  - Fourth Crossing, Laramie River
  - Fifth Crossing, Laramie River
  - Sixth Crossing, Laramie River
  - Seventh Crossing, Laramie River
  - Eighth Crossing, Laramie River
  - Ninth Crossing, Laramie River
  - Fort John Cemetery
  - Portugee Phillips Horse Monument
  - First Crossing, North Platte
- Natrona County
  - Camp Davis
  - Richards Bridge (upper)
  - Prehistoric Bison Trap Site
  - Last Crossing, North Platte
  - Mormon Ferry (Upper Platte)
  - Old Platte Bridge
  - Red Buttes
  - Astorian Cabin
  - Upper Crossing, North Platte
  - Goose Egg Ranch House
  - Emigrant Gap
  - The Poison Spring
  - Rock Avenue
  - Willow Springs
  - Prospect (Ryan) Hill
  - Alkali Slough
  - Creasewood (Horse) Creek
  - Wagon Train Destroyed
  - Sweetwater Station
  - Crossing of Sweetwater
  - Devil's Gate
  - T. P. Baker Grave
  - Devil's Gate Stage Station
  - Martin's Cove
  - Split Rock
  - Split Rock Station
- Platte County
  - Unknown Pioneer Graves
  - Ward and Guerrier's Trading Post

WYOMING, Continued
- Platte County, Continued
  - Lucinda Rollins Grave
  - Oregon Trail Monument
  - Warm (Big) Springs
  - Unidentified Grave
  - Cold Springs Monument
  - Cold Springs
  - Cold Springs Rifle Pits
  - Porter's Rock
  - Crossing of Cottonwood Creek
  - John F. Miller Grave
  - Crossing of Cottonwood Creek
  - Cottonwood Station
  - Red (Twin) Springs
  - Horseshoe Station
  - Horseshoe Station Monument
  - Horseshoe Station (upper)
  - Elkhorn Pony Express Station
  - A. H. Reel Wagon Train Fight
  - George Throstle Monument
- Sublette County
  - Parting of the Ways (two sites)
  - The Plume Rocks
  - Dry Sandy Crossing
  - Little Sandy Crossing
- Sweetwater County
  - Mormon Knolls
  - Table Hill
  - Little Sandy Crossing
  - Little Sandy Station
  - Big Sandy Crossing
  - William Ashley's Camp
  - Big Sandy Station
  - Little Sandy Crossing
  - Big Sandy Crossing
  - Charles Hatch Grave
  - Simson's Hollow (Gulch)
  - Unidentified Graves
  - Big Timber Station
  - Lombard Ferry
  - Robinson Ferry
  - Green River Crossing
  - Green River Ferry Station
  - Bridger-Fraeb Trading Post
  - Green River Crossing
  - Hams Fork Crossing
  - Pinckney Sublette Grave
  - South Bend Stage Station
- Uinta County
  - Church Butte-Solomons Temple

WYOMING, Continued
- Uinta County, Continued
  - The Needles
  - Burned Wagon Train
  - Second Crossing, Black's Fork
  - Third Crossing, Black's Fork
  - Unidentified Grave
  - Names Rock
  - Place of Black's Death

UTAH
- Morgan County
  - Dixie Hollow Pony Express Station Site and Marker
  - Pioneer Grant's Grave
  - Bauchman's Pony Express Station Site and Marker
  - Camp Clayton Site and Marker
  - Dutch Hollow - Utah War Fortifications, Ruins

UTAH, Continued
- Morgan County, Continued
  - Mormon Flat Historical Marker
  - Big Mountain Pass and Marker
  - Ephraim Hanks Pony Express Station Site and Marker
  - Camp Grant Site and Marker
- Salt Lake County
  - Little Mountain Summit
  - Last Camp Site and Marker
  - Donner Hill
  - Pioneer Monument
  - First Historical Monument at "This is the Place" Site (1936)
- Summit County
  - Cache Cave
  - Castle Rock
  - Hogsback Summit Wheel Ruts and Marker

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APPENDIX F

LETTERS OF COMMENT FROM STATE AND FEDERAL OFFICIALS

Illinois Department of Conservation
life and land together
605 STATE OFFICE BUILDING • 400 SOUTH SPRING STREET • SPRINGFIELD 62706
CHICAGO OFFICE – ROOM 100, 160 NO. LASALLE 60601
David Kenney, Director • James C. Helfrich, Assistant Director

December 29, 1977

Honorable Cecil D. Andrus
Secretary
United States Department of Interior
Office of the Secretary
Washington, D. C. 20240

Dear Secretary Andrus:

Please excuse my delay in responding to your letter of November 18, 1977, concerning the Mormon Trail Study.

On the whole we think the report is an excellent one and does a good job of defining the importance of the Mormon Trail. Our comments concerning Illinois' section of the Trail will be brief primarily because our involvement is as the beginning point. We feel that the best road for the government to take would be to use Alternative No. 3 - Designation and Marking of a National Historic Trail along the Mormon Trail - as outlined on page 58 of the report.

We stand ready to assist you in any way possible should you think it desirable for us to do so. Thank you for the report and for soliciting my opinion.

Sincerely,

David Kenney

DK/WGF/js

ROBERT D. RAY
GOVERNOR

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Office of the Governor
STATE CAPITOL
DES MOINES, IOWA 50319

ROBERT D. RAY
GOVERNOR

ELMER (DUTCH) VERMEER
ADMINISTRATIVE ASSISTANT

January 6, 1978

The Honorable Cecil D. Andrus
Office of the Secretary
U. S. Department of the Interior
Washington, D. C. 20240

Dear Mr. Secretary:

This office has reviewed the proposed report on the Mormon Pioneer Historic Trail prepared by the Bureau of Outdoor Recreation and concur with its recommendations.

The Mormon passage across southern Iowa was a significant event in early state history. The proposed Mormon Pioneer Historic Trail should do much to make that event meaningful to present and future generations.

Sincerely,

Elmer H. Vermeer
Elmer E. Vermeer
Administrative Assistant

EV:kjd

OFFICE
OF
PLANNING
AND
PROGRAMMING

STATE OF NEBRASKA

BOX 94601 · STATE CAPITOL · LINCOLN, NEBRASKA · 68509 · (402) 471-2414

Governor J. James Exon
State Planning Officer

Jon H. Oberg
Director

January 6, 1978

The Honorable Cecil D. Andrus, Secretary
Office of the Secretary
Department of the Interior
Washington, D.C. 20240

Dear Secretary Andrus:

Governor Exon has requested that this office conduct the review of the Mormon Trail Study. There does not appear to be any problem with including the Mormon Trail as part of the National Historic Trail System based upon the recommendations contained within the Mormon Trail Study.

Comments from other agencies are included for informational purposes as well as to correct certain errors in the text.

If this office can be of further assistance please let me know.

Sincerely,

Jon H. Oberg

Jon H. Oberg
Director

JHO:jkh

cc: Derrell P. Thompson

Enc.

WYOMING
EXECUTIVE DEPARTMENT
CHEYENNE

ED HERSCHLER
GOVERNOR

December 16, 1977

The Honorable Cecil D. Andrus
Secretary of the Interior
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

Thank you for the opportunity to comment upon the Mormon Trail study. I believe it is an excellent report and I support the conclusion that federal, state, local, and private interests be encouraged to join in a cooperative effort to preserve historic sites and develop recreation potentials. This is a far more practical alternative than that of establishing a continuous hiking trail. The proposed action will be comparatively less expensive, will pose far fewer conflicts with other uses, will provide for greater local control, and will safeguard the trail from overuse.

I suggest that both the Mormon and Oregon Trails be administered under this same theory. The trails occupy much of the same territory. I fear that we will have a chaotic situation if we administer the Mormon Trail in accordance with this proposal while managing the Oregon Trail as a continuous trail as proposed in H.R. 6900.

Yours sincerely,

EH/alr

cc: Hon. Clifford P. Hansen
Hon. Malcolm Wallop
Hon. Teno Roncalio
Wyoming Recreation Commission

1896

STATE OF UTAH
OFFICE OF THE GOVERNOR
SALT LAKE CITY
84114

SCOTT M. MATHESON
GOVERNOR

December 19, 1977

The Honorable Cecil D. Andrus
Secretary of the Interior
U.S. Department of the Interior
Washington, D.C. 20510

Dear Cece:

The State of Utah has reviewed the Mormon Trail study prepared by the Bureau of Outdoor Recreation pursuant to Public Law 90-543. The Mormon Trail is of signal importance to the State of Utah in terms of its historical, cultural and religious significance. We support the National Historic Trails category suggested in your letter to Vice President Mondale in May of this year and in the recommendations section of the study report entitled The Mormon Trail: A Potential Addition to the National Trails System (March 1977).

The State of Utah has a number of important trails of national significance (e.g., Mormon Battalion Trail, Dominquez-Escalante Trail, and Mormon Trail), all of which have been encroached upon by highways and other noncompatible land uses. For your information, the State of Utah, through its Division of Parks and Recreation, has invested approximately $4.5 million at the Pioneer Trails State Park (This Is the Place Monument), at Mormon Flat, and along the trail alignment over Big Mountain. The Division has submitted a 15-year plan for the trail and State Park which will require several million dollars to complete. Therefore, any federal assistance to mark or interpret the Mormon Trail would be welcome and needed.

Last year the recreational and historic value of the Mormon Trail was demonstrated in a Wyoming-Utah cooperative trailbike tour from Independence Rock, Wyoming, to This Is the Place Monument in Utah. Participants included Utah and Wyoming officials, historians, motorcyle and media representatives, and Mr. I. E. Dupont. The event proved to be an outstanding success and emphasized the recreational value for hiking, historical interpretation, motorized use, and scenic enjoyment.

In conclusion, we fully support the proposed amendment to the National Trails System Act of 1968 to include a Historic Trails category and the inclusion of the Mormon Trail as a designee under this category. We compliment

Page Two
The Honorable Cecil D. Andrus December 19, 1977

the Bureau of Outdoor Recreation on the study report and the effort that was required.

Please contact us if you need further assistance.

Sincerely,

Governor

SMM:geh

cc: Derrell P. Thompson, Director
Mid-Continent Region
Bureau of Outdoor Recreation
Denver Federal Center
P. O. Box 25387
Denver, Colorado 80225

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

February 27 1978

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

Thank you for the opportunity to review and comment on the Mormon Trail reports.

We concur with the conclusions that the route of the Mormon Trail fails to meet most of the established criteria for a National Scenic Trail. We also agree that a continuous hiking trail along the original route would not be practical because of numerous developments and obliteration of the original trail and campsites. The Mormon Trail is one of the components which make up the "great migration" corridor to the west and is a value which illustrates a significant part of our Nation's heritage. Because of this, we concur with the importance of commemorating the cultural and historic significance of this great migration corridor.

We agree with the concept of establishing a Mormon Pioneer National Historic Trail along existing trails, roads or highways that would approximate and commemorate the historic route. However, the National Trails System Act does not include a category "National Historic Trail." We suggest that it would be premature to recommend establishment of a National Historic Trail unless the proposal is coupled with or preceeded by an amendment to the National Trails System Act to provide direction for National Historic Trails. Our comments to the Office of Management and Budget on March 16, 1977, concerning draft legislation to establish a category of National Historic Trails outlines our thoughts regarding such trails. A copy is enclosed.

The Secretary of the Interior should be responsible for coordinating planning, development, and management of the proposed trail in cooperation with Federal, State and local Agencies and private organizations. The route goes through or near several proposed and/or completed Soil Conservation Service Watershed Recreation Projects. There may also be some resource, conservation and development measure plans along the route. Future planning and development should be coordinated with these projects by involving the appropriate Soil Conservation District Officials.

Sincerely,

M. Rupert Cutler
Assistant Secretary
Enclosure

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

JAN 04 1978

Dear Cecil,

In response to your letter of November 18, we have reviewed the proposed report on the study of the Mormon Trail. The report adequately documents the historic importance of the Mormon Trail and the need to recognize nationally this importance.

We are concerned, however, about the failure of the report to discuss fully the socio-economic impacts of designating the Trail as part of the National Trails System. The proposed Trail crosses several states, Wyoming in particular, where energy development activities are contemplated. Not discussed in the report are the types and degree of protection which will be afforded the Trail and the possible impacts of this protection on both the siting of energy development activities and their necessary utilities. I would suggest that a discussion of these impacts occur either in the section entitled, "Socio-Economic Effects," on page 57, or in an environmental impact statement on the proposal, if one is being prepared. We believe this analysis is necessary so that the report or impact statement can serve as a comprehensive decision-making tool.

Thank you for the opportunity to review the report.

With warm regards,

Sincerely,

Juanita

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

JR

MANPOWER,
RESERVE AFFAIRS
AND LOGISTICS

5 DEC 1977

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

In response to your letter of November 18, 1977 to the Secretary, we have reviewed your Department's report on the study of the Mormon Trail conducted pursuant to the National Trails System Act of 1968 (Public Law 90-543) and have no substantive comment to make thereon.

We appreciate your courtesy in making this study available for our review.

Sincerely yours,

Perry J. Fliakas

Perry J. Fliakas
Deputy Assistant Secretary of Defense
(Installations and Housing)

THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D. C. 20410

JAN [illegible]

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

This is in response to your letter of November 18, 1977 enclosing for HUD's review and comment a copy of the report on the proposed Mormon Trail conducted under the National Trails System Act of 1968, Public Law 90-543.

Based on Central Office review we agree to the designation of the route as the Mormon Pioneer National Historic Trail, placing it in that category of trails recently proposed by President Carter. We agree the Mormon Trail fails to meet established criteria for inclusion in the National Trails System as a National Scenic Trail. However, to the extent we are authorized to do so, the Department will encourage a pattern of development that accords due respect to the Mormon Trail.

As our Kansas City and Denver Regional Offices have a primary responsibility for administering HUD programs in areas through which the proposed Mormon Trail will go, I have requested my staff in the two Regions to review the draft report and inform me as to whether any significant environmental impact beyond those identified in the report will likely occur, particularly those related to the few urban areas on the trail.

My concurrence on this particular trail is subject to any specific recommendations on environmental concerns which our Kansas City and Denver Regional Offices may suggest. Should the Regional Office make specific recommendations which alter my present view, I will advise you promptly.

Sincerely yours,

Patricia Roberts Harris

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

FEB 6 1978

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

Dear ~~Mr.~~ Cece Secretary:

Thank you for the opportunity to comment on your proposed report on the Mormon Trail. We note that the report recommends that the trail be designated as the Mormon Pioneer National Historic Trail.

As you mentioned in your letter, the National Historic Trail is a proposed category of trail. Depending on the final version of the legislation, designation of these trails could result in extensive conflicts between the proposed trails and existing or proposed transportation facilities. We are particularly concerned that the trails may require excessive paperwork and program delays resulting from processing under the application of section 106 of the National Historic Preservation Act and section 4(f) of the Department of Transportation Act to large segments of these routes. In the case of the Mormon Trail, about 300 miles of the route are termed "Highway Segments" and almost 100 miles of this run along Interstate 80. Thus, designation of the trail could restrict future maintenance or improvements on I-80.

We would prefer to have the opportunity to review this and other proposed National Historic Trails after passage of legislation establishing such a category. In lieu of this, we believe it most prudent to exclude "highway segments" from any form of designation as part of a proposed National Historic Trail. Such segments could subsequently be incorporated on a case-by-case basis.

We appreciate the opportunity to review this report.

Sincerely,

Brock

Brock Adams

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